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ANNUAL REPORT
OF THE
STATE BOARD OF HORTICULTURE
OF THE
STATE OF CALIFORNIA,
FOR 1891.

SACRAMENTO:
STATE OFFICE, : : : : : A. J. JOHNSTON, SUPT. STATE PRINTING.
1892.

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1890/71

CALIFORNIA
STATE BOARD OF HORTICULTURE.

- ELLWOOD COOPER, President.....Santa Barbara,
Commissioner for the Los Angeles District.
- L. W. BUCK, Vice-President.....Vacaville,
Commissioner for the Napa District.
- S. RUNYON, Treasurer.....Courtland,
Commissioner for the Sacramento District.
- J. L. MOSHER, Auditor.....San Francisco,
Commissioner for the State at Large.
- FRANK A. KIMBALL.....National City,
Commissioner for the State at Large.
- A. F. WHITE.....Santa Rosa,
Commissioner for the Sonoma District.
- FRED. C. MILES.....Penryn,
Commissioner for the El Dorado District.
- I. H. THOMAS.....Visalia,
Commissioner for the San Joaquin District.
- A. BLOCK.....Santa Clara,
Commissioner for the San Francisco District.
- B. M. LELONG, Secretary.....Ex officio Chief Horticultural Officer.
ALEXANDER CRAW.....Quarantine Officer.
ELLA F. HALLAHAN.....Clerk.

Office of the Board:
No. 220 SUTTER STREET, SAN FRANCISCO.

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ERRATA.

On page 99 (the square system) read number of trees to acre "one hundred and eight" instead of "one hundred and nine;" also, in table (square) on page 104, and in line 11 (same page) from below.

REPORT.

OFFICE STATE BOARD OF HORTICULTURE, }
SAN FRANCISCO, CAL., January 23, 1892. }

Hon. H. H. MARKHAM, Governor of California:

SIR: In accordance with law, we have the honor to submit herewith our report for the year 1891, being the third annual report since the law was amended (Act of 1889) from biennially to annually, and the eighth report since the inception of our Board. The delay in its preparation was through circumstances over which we had no control.

FINANCIAL STATEMENT.

The forty-second fiscal year closed June 30, 1891, and the following are the expenditures for the year:

Library	\$275 95
Janitor	207 75
Rent	1,933 00
Stenographer	200 00
Postage	690 85
Sundries	187 27
Traveling expenses	1,943 09
Supplies	324 17
Repairs	234 30
Telegrams	61 45
Expressage, freight, and cartage	424 58
Publishing	2,085 30
Furniture	548 50
Papers	64 25
Messenger	204 00
Special agents and experimenting	3,139 90
	<hr/>
	\$12,524 36
Balance from forty-first fiscal year	\$26 02
State appropriation	12,500 00
	<hr/>
	\$12,526 02
Expenditures	12,524 36
	<hr/>
Balance	\$1 66

The expenditures of the present (forty-third) fiscal year, up to December 31st, are as follows:

Library	\$1,272 90
Janitor	80 90
Rent	675 00
Postage	121 50
Sundries	72 83
Traveling expenses	547 10
Supplies	50 60
Repairs	16 25
Telegrams	42 15
Expressage, freight, and cartage	159 40

REPORT OF STATE BOARD OF HORTICULTURE.

Publishing.....	\$1,910 25
Furniture.....	200 00
Papers.....	31 85
Messenger.....	43 00
Special agents and experimenting.....	468 05
	<u>\$5,691 78</u>
State appropriation.....	\$10,000 00
Expenditures.....	5,691 78
Balance.....	<u>\$4,308 22</u>

SALARY FUND.

Appropriation.....	\$4,800 00
Expended.....	2,400 00
Balance.....	<u>\$2,400 00</u>

EXPERT TO FOREIGN COUNTRIES.

Appropriation.....	\$5,000 00
Expended.....	1,500 00
Balance.....	<u>\$3,500 00</u>

Respectfully submitted.

ELLWOOD COOPER,
President

B. M. LELONG, Secretary.

Subscribed and sworn to before me, January 23, 1892.

[SEAL]

ALVAN FLANDERS,
Notary Public.

INTRODUCTORY.

TRANSACTIONS OF THE BOARD

AND

COMMISSIONERS' REPORTS.

CHAPTER I.

TRANSACTIONS

OF THE

STATE BOARD OF HORTICULTURE.

MARCH 10, 1890.

The Board met in Los Angeles pursuant to a resolution adopted at the meeting held in Fresno, November 8, 1889. The following Commissioners were present: Messrs. Block, Buck, Kimball, Miles, Mosher, Runyon, Thomas, and President Cooper. Absent: Commissioner White.

The minutes of November 4-8, 1889, were read and duly approved.

Nominations for the position of Vice-President, made vacant by the resignation of Commissioner Peck, were then declared in order.

On motion, the Secretary was directed to cast the vote of the Commissioners present for Commissioner Buck.

The Secretary cast the vote of the Commissioners present for Commissioner L. W. Buck, for the position of Vice-President, and he was declared unanimously elected by President Cooper.

The report of the Secretary was read, covering the period since the last meeting of the Board, and was ordered placed on file.

The Treasurer's report was then read, making the following exhibits:

Appropriation		\$12,500 00
Total expenditures since last report up to March 1, 1890	\$3,714 92	
Amount expended up to last meeting	6,569 61	
		10,284 58
Balance		\$2,215 47

SALARY FUND.

Appropriation	\$4,800 00	
Expended	3,200 00	
Balance		\$1,600 00

The report of the Treasurer was, on motion of Commissioner Block, ordered placed on file.

REPORT OF THE EXECUTIVE COMMITTEE.

The Executive Committee then presented their report, as follows:

SAN FRANCISCO, CAL., March 1, 1890.

To the honorable State Board of Horticulture of California:

GENTLEMEN: Your Executive Committee beg leave to present for your consideration the following report, which is the result of their examination of the books, accounts, and vouchers in the office of the Secretary of the Board, as well as of all the property under the control of the

Board, including office furniture, fixtures, library, etc., made at the office of the Board, February 24 and 25, 1890:

First—The book of original entry, covering the period from July 1, 1888, to February 8, 1890, every entry being examined in detail, clearly showed the amount paid and for what it was paid.

Second—We examined as a whole all the bills paid by the Board from date of removal to present offices, about July 14, 1887, to February 8, 1890, and compared each bill with the receipt showing its full payment.

Third—We examined and appraised all the furniture, in most instances relying upon the bills for value, and where no bills were found, the value was estimated.

Fourth—The library we found to contain the following number of books: Twenty-one volumes turned over by the former to present Secretary; two hundred and two volumes secured through exchange; six hundred and eighteen volumes bought, and two hundred and eighty-seven volumes bought in paper covers or without covers, and which have been bound or are in process of binding—one thousand one hundred and twenty-eight volumes in all, and valued as follows: Twenty-one volumes, \$210, estimated. The values of the following were ascertained from the bills: Nine hundred and five volumes, \$1,235 90; two hundred and sixty-two volumes, \$100. One thousand one hundred and twenty-eight volumes, \$1,545, total value of library.

Fifth—Electrotypes and woodcuts, forming an exceedingly valuable collection, covering about eighteen superficial feet, cannot have cost less than \$1,000, although we did not separate the bills of items, so as to determine the exact cost. These cuts and electrotypes number three hundred and sixty pieces, some of them as many as five separate subjects.

Sixth—We found an itemized account of old furniture, waste paper, rubbish, and truck sold, amounting to \$79 50, said amount having been turned into the State Treasury.

Seventh—We found by the Secretary's report a balance of \$2,214 27 remaining to the credit of the Board to carry on all its operations till the close of the present fiscal year, June 30th. The average monthly expenses for the nineteen months from July 1, 1888, to February 1, 1890, have been about \$520. Applying this average to the remaining months of the present fiscal year, we find that \$2,600 will be required. However, from this amount there should be deducted one month's rent, \$135, not embraced in the above statement, and also the sum of \$223 64 in value of postage stamps now on hand, thus leaving the amount at the disposal of the Board about equal to the probable expenses to be incurred before the close of the present fiscal year.

Eighth—A careful examination of the various rooms and offices of the Board disclosed the fact that the total value of the furniture, fixtures, carpets, etc., amounted to \$2,700, which amount does not include the expense of putting up the various partitions, painting, etc.

Ninth—The actual running expenses of the Board, based on the amount disbursed in the nineteen months, July 1, 1888, to February 1, 1890 (not including salaries, which are provided for by law, nor the purchase of any permanent property), is estimated to be as follows:

Expenses of members of Board attending two Conventions	\$640 00
Expenses of members of Executive Committee attending two meetings.....	340 00
Expenses, incidental, two Conventions.....	150 00
Expenses of stenographer, two Conventions	500 00
Traveling expenses of two clerks, two Conventions.....	160 00
Expenses one year's rent, twelve months, at \$135 per month.....	1,650 00
Incidental office expenses, twelve months.....	1,284 00
Postage stamps, \$105 per month, twelve months	1,260 00
Total	\$6,154 00

This estimate is based entirely on the average expenses of the Board during the period reviewed, but cannot fairly represent our future requirements, especially when we consider the constantly increasing demands made on the Board for many purposes, among which we may mention the increasing demand of fruit growers for experimental work in suppressing our numerous fruit pests, and the study of diseases of trees and plants; the largely increased expense of the annual report, consequent upon its increased size. The present report being larger than any previously published, a greater sum will be required in its distribution, not only in postage, but in express and freight charges, in drayage, in paper for wrapping, in boxes for transportation in quantity to Conventions and districts. In fact, we may say that the work of the Board is increasing so fast in importance that its expenses, with the most rigid and exacting economy, cannot be estimated at less than \$6,250 for the coming fiscal year.

Tenth—A careful examination of the books of the Secretary develops the fact that during the period from April 17 to July 1, 1887, there was no money in the State Treasury with which to pay the absolutely indispensable expenses of the Board, and that the Secretary paid such bills to the amount of \$414, and that no portion of such indebtedness has been refunded to Mr. Lelong. We also found that Mr. Lelong had also paid out \$166 78 in discounts on State warrants, a part of such discounts having actually been paid to the officers of the Board. We also found bills to the amount of \$80 18, which were paid by the Secretary, and no part thereof has been returned to him.

We further found that while acting under the instructions of the Board, during the presentation and pendency of the amended horticultural bill before the Legislature, that the Secretary incurred expenses for traveling and other incidentals to the amount of \$362 30, itemized statements being rendered for every disbursement. We therefore find that there is now due to Mr. Lelong the sum of \$1,023 71, for moneys actually disbursed by him for account of the State Board of Horticulture, which sum does not embrace any charge for interest, which is properly chargeable for the use of his money.

For the coming fiscal year, June 30, 1890, to June 30, 1891, the appropriation is	\$12,500 00
Minimum estimate for expenses	\$6,250 00
Due Secretary	1,023 71
	<hr/> 7,273 71
Leaving a probable balance of.....	\$5,226 29

The publications of the Board must sustain the enviable character of the horticulturists of our State, and to do it every step must be an advancing one; and in this regard, we may say that we believe the dissemination of exact knowledge deduced from experiments, through the

medium of our publications, to be the most important feature in the work of our Board.

To summarize, we beg to say that after a careful examination of the offices of our Secretary, we find that his duties have been performed in an exceedingly satisfactory manner. We find the furniture and fixtures of the offices of the Board to be of a useful and not of an extravagant character, when the importance of this department is considered.

The general arrangement, neatness, and good order maintained at all times is highly commendable to our Secretary, and is worthy of great praise.

Respectfully submitted.

FRANK A. KIMBALL,
J. L. MOSHER,
ELLWOOD COOPER,
Executive Committee.

Commissioner Block made a few complimentary remarks and said he was, indeed, very glad that such report was made, and moved that the report be received, adopted, and spread in full upon the minutes of the Board, as the sentiments of the Board toward the Secretary, for the efficient services performed by him since his accession to the office. Motion carried unanimously.

Commissioner Block moved that the Executive Committee be and are hereby given full power to settle the account due the Secretary in any way they choose. Motion carried.

On motion of Commissioner Block, Commissioners Cooper, Mosher, and Miles were appointed to draft a suitable set of resolutions in memory of the late General M. G. Vallejo, former Treasurer and Commissioner.

The President made a statement with regard to a parasite that is now destroying the red scale in Florida.

Commissioner Block moved that the Executive Committee be authorized to procure said parasite for distribution in this State. Motion carried.

On motion of Commissioner Block, the Secretary was granted a leave of absence of eight weeks, said leave to be taken under the direction of the Executive Committee.

On motion, the Board took a recess, to meet at the call of the President, out of respect to the memory of the late General Vallejo.

RESOLUTIONS OF RESPECT.

MARCH 14, 1890.

The Board met pursuant to adjournment. All the Commissioners were present except Commissioner White.

The committee appointed to draft resolutions of respect to the memory of the late General Vallejo, submitted the following:

WHEREAS, It has pleased Almighty God to remove from our midst General M. G. Vallejo, our former Treasurer, and Commissioner for the Sonoma District; therefore, be it

Resolved, That in the death of General Vallejo we have lost a warm friend, and the

State a dutiful servant, who for many years occupied the position of Treasurer of this department;

Resolved, That we, the State Board of Horticulture, in session at Los Angeles, this the fourteenth day of March, 1890, extend to the family of the late General Vallejo our sympathy and condolence in this their great bereavement;

Resolved, That these resolutions be spread in full upon the minutes of the Board, and that a copy be engrossed and attested to by the officers of this Board, and transmitted to the family of the late General Vallejo.

ELLWOOD COOPER,
J. L. MOSHER,
FRED. C. MILES,
Committee.

Commissioner Block moved that the resolutions be adopted and spread in full upon the minutes of the Board, and a copy be transmitted to the family of the late General Vallejo. Motion carried unanimously.

Commissioner Block moved that the next State Convention of Fruit Growers be held at Santa Cruz, the date thereof to be fixed by the President. Motion carried.

Commissioner Buck moved that when the Board adjourn, it do so to meet at Santa Cruz, at the call of the President. Motion carried.

On motion of Commissioner Block, the subject-matter with regard to lithographic plates for the next annual report was referred to the Executive Committee, with full power to act.

The committee appointed to draft resolutions with regard to the work performed by the Secretary, presented the following:

To the honorable State Board of Horticulture:

GENTLEMEN: We most respectfully recommend the adoption of the following resolution as the sentiments of this Board towards our Secretary:

Resolved, That the thanks of the State Board of Horticulture are due and are hereby tendered to B. M. Lelong, Secretary of said Board, for the able and efficient manner in which he has performed the duties of his office, from the date of his accession to the office to the present date, and especially in the collection and preparation of the material for the report of this Board for the year 1889.

Respectfully submitted.

FRANK A. KIMBALL,
A. BLOCK,
L. W. BUCK,
Committee.

Adopted by unanimous vote.

The Board then adjourned.

REPORTS OF OFFICERS.

NOVEMBER 18, 1890.

The Board met in pursuance to call, at Santa Cruz. The following Commissioners were present: Messrs. Block, Buck, Miles, Mosher, Runyon, Thomas, White, and President Cooper. Absent: Commissioner Kimball.

The minutes of March 10-14, 1890, were read and approved.

TREASURER'S REPORT.

The Treasurer, Sol. Runyon, presented his report from March 10 to October 7, 1890. Said report showed the following exhibit:

Expenditures—March 5, 1890.....	\$364 93
Expenditures—March 31, 1890.....	1,848 32
Total.....	\$2,213 25

Leaving a balance from the forty-first fiscal year of \$1 02, which, with \$25 discount from a bill for Stenographer's fees, leaves a balance of \$26 02, which is credited to the forty-second fiscal year.

FORTY-SECOND FISCAL YEAR.

July 11, 1890	\$2,756 75	
July 30, 1890	402 80	
August 19, 1890	362 85	
September 4, 1890	483 24	
September 25, 1890	853 58	
October 7, 1890	734 12	
	<hr/>	\$5,593 34
Balance forward from forty-first fiscal year	\$26 02	
Appropriation	12,500 00	
	<hr/>	12,526 02
		<hr/>
Balance		\$6,932 68

On motion of Commissioner Block, the report was accepted and ordered placed on file.

SECRETARY'S REPORT.

The report of the Secretary was read, covering the period since the last meeting, as follows:

To the honorable State Board of Horticulture:

GENTLEMEN: I have the honor to submit to your kind consideration this brief report, as your Secretary, since your last meeting:

The annual report of the Board for the year 1890 has just been issued, although it is still in process of binding. This report contains four colored lithographic plates, eleven photo-engraving plates, and numerous wood engravings. I exceedingly regret that press of time should not have permitted further investigations; this, however, will be followed through the winter months, and the results of the experiments so made will be issued from time to time in bulletin form.

In accordance with your views as expressed at the last meeting, the Executive Committee has caused an investigation to be made with regard to the parasites and predaceous insects that have been reported to exist in various parts of Florida. These investigations were carried on very extensively, and the results have been published in bulletin form. The orchards that had been reported as having been freed of scale insects by parasites were carefully examined, and were found to be yet infested, although very slightly. No parasites were found that had decreased the pests, but the trees had thrown off, or rather outgrown them to a certain extent, by the use of chemical fertilizers, which were applied to the soil very freely. By this method the trees are made to outgrow the damaged or infested parts of the trees. Everything that was considered of any value to horticulturists was looked into, and the trip was indeed very inexpensive, and the information obtained has proved of much good. We are now in communication with parties in various countries, and consignments of parasites and predaceous insects will be secured in this way.

The Executive Committee has had three meetings since your last session. At the meeting of July 1, 1890, there were present Commissioners Cooper, Kimball, and Mosher. November 18th to 21st, inclusive, was the date fixed for the holding of the Fourteenth State Fruit Growers' Convention, at Santa Cruz.

A meeting was called for July 30th, but no quorum being present,

Chairman Mosher adjourned the meeting to August 13th. Accordingly, the committee met to consider applications for the position of Quarantine Officer. After due consideration of all applications before them, Alexander Craw was selected as such. On motion of Commissioner Cooper, Mr. Craw was made ex officio Entomologist of the Board. Said appointment was made to take effect September 1, 1890. Miss Ella Hallahan was instructed to fill the office during said interim.

It was ordered that two glass houses be immediately erected for the protection and propagation of the *Vedalia* through the winter. In accordance with the order made by the Executive Committee, bids were called for the erection of two glass houses covering orange trees eighteen feet high. The lowest bidders were J. M. Griffith & Co., of Los Angeles. Their bid was as follows:

Material for two glass houses.....	\$390 00
Glass and glazing.....	156 75
Hooks and hinges.....	2 00
Four hundred and eighty-six feet sash.....	8 17
Carpenter work.....	26 00
Total.....	\$582 92

Apart from this there were a few extras, amounting to \$12 05; the painting cost \$23 50, and the sixty-four square feet of fine brass wire mesh, used in the ventilators, at 55 cents per square foot, cost \$31 68, making the total cost, complete, \$650 15. These houses are very substantial, and will last many years to come. They were erected upon the grounds of Col. J. R. Dobbins, at San Gabriel. Colonel Dobbins has kindly offered to assist the Board in the undertaking. He will care for and watch the progress made by the *Vedalia* during the winter months without charge. Last winter it appeared very much as if the *Vedalia* had died out, and perhaps it was due to the efforts of this Board that they were preserved through the winter. Many colonies were placed in various parts late in winter, and from these places they were distributed all over the State in the spring. In the spring none could be found anywhere in the State, except where they had been colonized by the Board. The committee has felt that the risk of their living through the winter unprotected is too great, and it is to prevent any possibility of a failure that these precautions have been taken.

At the last Convention held in Los Angeles, it was resolved to present to Mr. Albert Koebele, the discoverer of the *Vedalia cardinalis*, a suitable memento, as a token of esteem from the fruit growers of California.

In accordance with the resolution adopted, the following subscribed most liberally: Mrs. Hannah Hollister, Santa Barbara; J. A. Graves, Los Angeles; A. B. & A. S. Chapman, San Gabriel; Sol. Runyon, Courtland; Ellwood Cooper, Santa Barbara; J. W. Wolfskill, Los Angeles; S. P. Stow, Santa Barbara; A. Block, Santa Clara; L. W. Buck, Vacaville; D. W. Coquillett, Los Angeles; "Rural Californian," Los Angeles; G. B. Griffith, Los Angeles; Sutter County Horticultural Society; J. DeBarth Shorb, San Gabriel; H. W. O'Melveny, Los Angeles; Tim Carroll, Anaheim; First National Bank of Pasadena, Pasadena; N. W. Blanchard, Santa Paula; George S. Patton, San Gabriel; Newhall & Hall, Duarte; W. H. Workman, Los Angeles; S. Richardson, San Gabriel; Germain Fruit Company, Los Angeles; Theo. Deming, Sacramento; G. F. Starr,

Yuba City; Fred. C. Miles, Penryn; F. E. Gray, Alhambra; Abbot Kinney, Lamanda Park; B. G. Stabler, Yuba City; N. C. Carter, Pasadena; E. W. Maslin, Sacramento; A. J. Cooper, Los Angeles; Sam McKinlay, Los Angeles; R. H. Gilman, Anaheim; A. C. Thomson, Duarte; John Burr, San Fernando.

It was decided that for the present the most suitable memento to be given Mr. Koebele be a gold watch, chain, and charm, and a set of diamonds for Mrs. Koebele. Accordingly, by special request, these presents were selected and purchased by two committees, consisting of Commissioners Mosher and Miles, W. H. Robinson of Stockton, Alex. Craw and Chris. Jorgensen of San Francisco. The watch bears the following inscription:

"Presented by the State Board of Horticulture, to Albert Koebele, the discoverer of the Vedralia cardinalis, as a token from the fruit growers of California, November 18, 1890."

I now turn the same over to President Cooper, who has been especially requested to present the same to Mr. Koebele and wife. I also turn over the balance of the unexpended funds and all vouchers thereto attached.

In closing, allow me to express to you my feelings of gratitude, and to thank you warmly for the most magnificent silver tea service which you, on June 24, 1890, commissioned to bear to me a birthday greeting.

The work you are doing and the results accomplished will forever stand to your credit, and what little I may have done to assist you in your good work has been with the aim of relieving you of part of the great responsibilities delegated to you by the people. It has been my good fortune to become associated with men who vie with each other to promote the interests and welfare of a great and noble State.

Very respectfully yours,

B. M. LELONG,
Secretary.

SAN FRANCISCO, CAL., November 15, 1890.

The report of the Secretary was adopted and ordered spread in full upon the minutes.

The Executive Committee laid before the Board the cause of the resignation of George Rice on July 1, 1890. The Board, after due consideration of the facts laid before them, approved the action of the Executive Committee by unanimous vote.

Commissioner Block offered the following resolution, which was adopted unanimously:

Resolved, That we, the State Board of Horticulture, approve the action of the Executive Committee in the matter of the appointment of Alexander Craw as Quarantine Officer.

Commissioner Block moved that the fifteenth State Convention of Fruit Growers be held at Marysville, in November, 1891. Adopted.

REPORT OF SEMI-ANNUAL SESSION.

APRIL 15, 1891.

The Board convened in semi-annual session, at the office of the Board in San Francisco. Present: Commissioners Kimball, Miles, Mosher, Runyon, Thomas, and President Cooper. Absent: Commissioners Block and Buck.

Letters were read from Commissioners Block and Buck, regretting their absence.

The minutes of November 18th were read and approved.

TREASURER'S REPORT.

The report of the Treasurer, Sol. Runyon, showed the expenditures made since the last meeting, as follows:

Warrants paid—October 25, 1890	\$462 82	
November 26th	727 40	
December 3d	1,855 75	
December 31st	508 14	
January 29, 1891	619 81	
February 28th	529 83	
	<hr/>	\$4,759 75
Amount expended per last report		5,594 84
		<hr/>
Total		\$10,354 09
Appropriation	\$12,500 00	
Balance on hand from forty-first fiscal year	28 02	
	<hr/>	\$12,528 02
		<hr/>
Balance unexpended		\$2,171 93

The Executive Committee certified that they had examined the report, and that the same was correct. The report was adopted, and ordered placed on file.

REPORT OF EXECUTIVE COMMITTEE.

The Executive Committee then presented their report, as follows:

To the honorable State Board of Horticulture:

GENTLEMEN: We, the Executive Committee, met on January 19th and on April 14, 1891, for the purpose of examining the books of the Board kept by the Secretary, and those kept by the Treasurer. We beg to report that we examined the books, and all vouchers in detail, from the date of our last report, March 1, 1890, to date, and find the same correct. At your coming meeting we shall submit a fuller report, embracing all the expenditures so made.

Very respectfully submitted.

J. L. MOSHER,
ELLWOOD COOPER,
FRANK A. KIMBALL,
Executive Committee.

The report was adopted, and ordered placed on file.

ELECTION OF OFFICERS.

The President announced the next order of business to be the election of officers for the next two years. The following were elected by unanimous vote:

President.....	Ellwood Cooper.
Vice-President.....	L. W. Buck.
Treasurer.....	Sol. Runyon.
Auditor.....	J. L. Mosher.
Secretary and Chief Horticultural Officer.....	B. M. Lelong.
Quarantine Officer.....	Alexander Craw.
Clerk.....	Ella Hallahan.

President Cooper, on taking the chair, delivered the following address:

ADDRESS OF HON. ELLWOOD COOPER.

In accepting again the position of President, I am not unmindful of the duties or responsibilities involved in so doing. We will be called upon to do more and make greater efforts in advancing the fruit industry. The attempt to abolish the State Board by the last Legislature ought to convince us that we will have to watch with the greatest care all legislative action, so as to prevent the possibility of such a calamity as would result in any change in our organization. Among the fruit growers and intelligent citizens of the State there can be but one feeling as to the importance of the work we are called upon to perform. We must accept the position only with the conviction that more is required of us.

The first horticultural bill was found to be inadequate, and required many amendments, which have been secured from time to time, until, as I thought, we had succeeded, at the hands of the previous Legislature, in getting a law that enabled us to render the greatest service to the fruit industry. We found that after all this struggle, and the devotion to the cause that stimulated our members in giving their time and best thoughts to the welfare of the State, that an attempt by ignorant legislators, either from partisan motives or for mere sensation, was made to wipe us out of existence with one sweeping stroke. The thing that we have to do is to prevent the possibility of such action in the future. If each coming Legislature is to tamper with the horticultural interests, we cannot do effective work nor secure the best service in our executive officers.

We have now a very effective working department; our officers command the respect of fruit growers, are intelligent, energetic workers, and are doing a service to the State that would be difficult to replace in the event of a change that might take place if their holding was insecure. Bordering States have seen the wonderful development of our fruit industry. All of them are untiring in their efforts to follow California's example. They are creating similar laws on the subject and will outbid us for effective service. We must, therefore, secure permanency to valuable workers. We must have an understanding among all the fruit growers of the State that any legislator who dares to tamper with the horticultural interests must be debarred from any further political position requiring the suffrages of our people. This will be simple and tangible, because we represent all political parties. In the event of corruption or misapplied funds, I am confident that each member of the Board

would be first to denounce it, and eager in his efforts to bring about a change. The law is sufficiently explicit and has been wisely drawn. If the Governors do their duty, bad appointments will not be made. That our enemies were insincere is proved by the fact that not a single vote was recorded against us when it came to a final passage.

In our interview with his Excellency Governor Markham, I am happy to state he is in accord with the fruit industries, and fully agrees with the great feature of our work—that is, to furnish the literature that will inform the fruit growers how to be successful in fruit growing.

Now, gentlemen of the State Board of Horticulture, I call upon you, each one, to present a plan (in writing) to be discussed at a Board meeting to be held in Marysville, November next, before the Convention convenes, as to how the legislative matter is to be presented to the fruit growers at said Convention. If there is to be uncertainty in the permanency of the work, I, for one, will feel discouraged and must decline any longer to take an active part.

An appropriation of \$5,000 has been given to us for the purpose of defraying the expenses of an entomologist to Australia and adjacent islands to search for parasitic insects, and send same (if to be found) to California for colonization and distribution among our fruit growers, to counteract the ravages of noxious insects so destructive to the fruit industry. We have written to the Secretary of Agriculture at Washington, asking of his department to place at our disposal Albert Koebele, to send on such mission.

The importance of such a mission cannot be overestimated. I recommend that we pass a resolution of thanks to the Legislature and to his Excellency Governor Markham, for placing this amount at our disposal. Something ought to be done, some plan organized by which our horticultural reports could be reproduced. We are now without books, with a constant and increasing demand. At the meeting of the next Legislature we must be prepared to present definite information as to the size and probable cost of reproducing our entire work—that is, to abridge, selecting all the most important parts, and putting in such shape that all the reports, commencing with 1885 and 1886, down to 1891, and including the same, would make one volume of about seven hundred or eight hundred pages. Such a book could have no equal in horticultural importance. It would be invaluable to our public schools—in fact, it is a necessity.

A certain number will be required for every school in the State. These books are now required by the curriculum of the schools. The children will not only be acquiring a knowledge of entomology, but a practical knowledge of fruit growing. Eastern tourists are purchasing lands in all parts of the State. It seems to be the ambition, the one desire, to possess a fruit orchard. We should encourage this, and furnish such information as would encourage them as well as save them from serious mistakes. To satisfy this demand will require twenty thousand copies. Some arrangement should be made to sell copies to other States and foreign countries. Probably five thousand copies would be sufficient for this purpose. Such books could be sold at a large profit to the State. I shall, at an early date, get the estimate from the Superintendent of Public Instruction, of the probable number necessary for the public schools, and at a future meeting present my final recommendation.

The horticultural industry is the growing industry; it will sooner or

later be the all-absorbing interest. We cannot take any steps backward, nor remain in a stationary position; we must advance. Our greatest advancement will be through the medium of public schools. There is a fascination in the study of natural science and the development of plant life. It has been demonstrated already, even with the little that has been done, that the school children have been eager in the pursuit of this knowledge. Baron Ferd. Von Mueller maintains, in his valuable lectures on arboriculture, that the human mind cannot be properly developed without coming in contact with growing plants. The care engenders a sentiment, a feeling, for the protection of their best development. No matter how degrading may have been the surroundings of little children, as soon as their notice and attention, their responsibility, are turned towards the care of plants, their watchfulness and guardianship are manifested in a remarkable degree. No instinct in children is so susceptible of development as their love of animals, their love of plants. It can be strengthened to such a degree as to be a bar against their selfish nature, a bar against surrounding evils.

We need a larger appropriation to prosecute our searches for parasitic insects. Hundreds of thousands of dollars are expended in fighting insects by the various methods, which, at best, are only partially effective, and may, in the end, be given up. We should not relax our efforts in the direction of procuring the natural enemies to destroy all noxious insects that disturb our fruits. If our intelligence is not employed in the right direction we will surely be defeated. Then let us adopt nature's plan, and call to our aid that which was created for the special purpose and placed within our reach. Our efforts will be crowned with success, and will pass down through history to the credit of California fruit growers that they were first to practically demonstrate this part of the plan of creation.

The question of economy in the State appropriations should not deter us from demanding ample funds for such purposes. The State has appropriated \$300,000 that the different industries could be properly exhibited at the coming World's Fair. In the past few years millions have been appropriated for prisons, insane asylums, homes of different kinds, places for the wicked and unfortunate. The criminal is better housed and fed than some of our worthy and most industrious. Are these classes to absorb all our surplus, or shall we do something to encourage the worthy, the industrious, who are struggling for mere existence? We are rapidly multiplying inmates for these various institutions. The misery and degradation caused by drunkenness, by idleness, and the whirl of shams in the extravagances of modern society, is appalling. Let us turn our sympathies a little from the vicious and unfortunate to the virtuous, industrious, and self-supporting. Our best thoughts and greatest energies should be given in their behalf. By education alone can we counteract the growing evils. The laws of creation, in their relation to the products of the soil, is the one important element in the instruction of our youths. It transcends everything else. Horticulture is the highest branch in this department. Our scope must be enlarged; we must assume a position adequate to the importance of our calling.

SECRETARY'S REPORT.

The report of the Secretary was read, wherein he informed the Board of the doings of his office, and subordinates, since his last report; also as to the legislative enactments, correspondence, etc., and the following expenditures since the last report, viz.:

Library		\$287 20
Papers, subscriptions to		60 40
Repairs		68 70
Telegrams		37 20
Office furniture		533 75
Janitor		146 75
Rent		1,393 00
Office supplies		248 27
Cartage, freight, and expressage		247 61
Stenographer		200 00
Postage		655 15
Publishing		2,017 10
Experimenting		2,495 67
Salary, special agents		391 60
Salary, clerk		140 00
Traveling expenses, Commissioners		789 00
Traveling expenses, officers		508 00
Sundries		154 60
Total		\$10,354 09
Appropriation	\$12,500 00	
Balance on hand from forty-first fiscal year ..	28 02	
		12,526 02
Balance unexpended		\$2,171 93

Also, that the Legislature had allowed for the uses of the Board, for the forty-second and forty-third fiscal years, the following amounts:

For the uses of the Board	\$20,000 00
For salaries	9,600 00
For expert to Australia	5,000 00
Total	\$34,600 00

REPORT OF THE QUARANTINE OFFICER.

The report of the Quarantine Officer was then read, and ordered placed on file, as follows:

SAN FRANCISCO, CAL., April 14, 1891.

GENTLEMEN: I take pleasure in submitting to you the following report of the doings of the division under my charge:

During the past year many thousands of fruit trees have been imported into California from other States and foreign countries. As the danger of introduction of new insect pests upon them has been to a certain extent great, I made it my special duty to carefully investigate their condition upon arrival on board of steamers in this port. When any pests known to be injurious were found upon the trees, they were kept in quarantine until disinfected or destroyed, in accordance with my instructions. Several lots of trees from Japan have been received infested with *Mytilaspis Gloverii*, which is one of the most destructive of scale insects, as it attacks the wood, leaves, and fruit. Those trees were destroyed.

Another importation of plants (*Gardenia Fortunei*) from Japan, contained specimens of the wax scale (*Ceroplastis rusci*) in various stages

of growth. Those plants were disinfected. I have frequently made careful inspection of them since, but could not find any live scale.

At present citrus trees are being imported from Tahiti, and so far no lot has been received free from injurious insects. Lately a lot was received, and found to be badly infested (even down in the roots) with three different kinds of scale, not yet known in this State; one was a species of *Lecanium*, one a *Mytilaspis*, and the other a very small *Aspidiotus*, that completely covered the stem. These trees were immediately cast into a fire and burned, root and branch. I hear of several lots that are expected soon; one is a full cargo per the schooner "Lena Sweasey," due about the end of the present month. The various County Boards and I are on the alert, and anxiously await their arrival, so that they may not be distributed throughout the State before they are carefully examined. To this end every precaution will be taken.

Many trees have been received by rail, and the County Boards of Horticultural Commissioners throughout the State have kept a sharp lookout, so that no infested stock should escape. The Eastern peach tree borer is the most destructive insect found upon this stock. This pest is very similar to the California species, and as trees have been imported from the Eastern States for many years past, it no doubt has been brought here in that way. In the early part of the season I examined nearly all the large lots received, and when found infested I immediately notified the owners to disinfect the trees by dipping into a strong and hot insecticide solution, and caused the destruction of all those that showed the presence of borers. I addressed letters to all the County Boards in regard to this, and in order that growers may be able to distinguish the borers and also protect their trees against attack, I have issued, under your instructions, a bulletin, in which the two species are illustrated; a full description is also given, also recommendations for their destruction.

I am pleased to report the success attending the measures adopted by the Board last August for the preservation and propagation of the Australian ladybird (*Vedalia cardinalis*). The two glass houses constructed under Mr. Lelong's direction at San Gabriel, and inclosing large orange trees, have proved well adapted for the purpose. On the fifteenth of October both trees were stocked with the cottony cushion scale, and by the end of December they had taken complete possession of the trees, and impressively reminded one of the experience of the past few years. A small colony of the *Vedalia* was placed in one of the houses, and the other was reserved for feed or future use in case of emergency. The ladybirds bred, and the young larvæ are now becoming numerous, and will soon be ready for distribution. Many fruit growers have already made application to me for colonies, the *Icerya* having again appeared in their groves.

In several localities the *Aspidiotus perniciosus* has decreased in numbers; a new internal parasite has been discovered, and will be watched with interest.

At present there is considerable discussion concerning what has caused the destruction of scale insect pests infesting trees in various sections throughout the State. In most every case where such conditions have been reported, the work of some agent is plain. I have made several examinations, and in most every instance found parasites at work, and to whom the work of extermination may be credited. Attention is

called to the various bulletins lately published, wherein they are fully set forth.

N. W. Motheral, under date of March 28, 1891, reports: "All the orchards in this part of Tulare County (Hanford) are comparatively clean. The scale is being rapidly destroyed by the *Chilocorus bivulnerus* and the *Scymnus marginicollis*. The trees infested with scale are covered with the larvæ of the *Scymnus*, and if no accident befalls them the pernicious scale will be a thing of the past in Tulare County. Nowhere else do they seem to be doing as good work as here, although at Mountain View, near San José, I saw this *Scymnus* in considerable numbers, and have learned that the scale has since disappeared. There is also a small fly, coming to maturity in June, preying on the pernicious scale, but their work is not extensive."

Upon some of the orange trees imported from Japan I found a few yellow scales (*Aspidiotus citrinus*), from which I hatched the same parasite that is at work in several orchards at San Gabriel. This goes to prove that we have got the true enemy of this scale. Bulletin No. 57 illustrates and describes this parasite, and also gives directions about colonizing them.

Next to insect pests, fungi diseases claim the attention of fruit growers, for annually great quantities of fruit are destroyed by this low order of vegetable life. Their spores are so light that they are carried by the wind and reinfest trees that have been disinfected, unless the fungicide contains chemicals that will remain active upon the tree during the growing season. Most fungi remedies to be effective have to be applied at least three times during the season, and as this implies an increased expenditure, the discovery of a more lasting fungicide will be the primary object in the experiments now under my charge.

During the summer months I will conduct extensive experiments to ascertain the best remedies for the various pests infesting fruit trees. The trees at that season of the year are more susceptible to injury, but, at the same time, the insects are in the most vulnerable stage, and the remedy used must be such as will not injure the tender foliage or fruit.

I have at all times tried to discourage the importation of trees into this State, especially when it is known that many of the districts where they are grown are badly infested with dangerous insect pests and diseases. This State is, so far as I know, free from the peach yellows (a constitutional disease of the peach tree in the East) and the Eastern plum curculio. Every precaution should be taken to prevent any of these pests or diseases from being introduced. However strange as it may appear, the fruit men are among the first to purchase such trees, even when aware of the danger not only to their own interests, but those of the entire State.

The correspondence in my division has been quite large; also the receipt of specimens for identification, the scope of which covers the entire State. But as it is desired to also learn of matters of importance to fruit growers from abroad, I have entered into correspondence with parties in foreign countries with the object in view of ascertaining anything of importance relating to parasites, predaceous insects, etc., that could be profitably and successfully introduced into this State.

Respectfully submitted.

ALEXANDER CRAW,
Quarantine Officer.

WORK OF THE YEAR 1891.

NOVEMBER 19, 1891.

The Board met in pursuance to call, at Marysville. Present: Commissioners Block, Buck, Kimball, Mosher, Miles, Runyon, Thomas, and White. Absent: Commissioner Cooper.

The minutes of April 15, 1891, were read and approved.

TREASURER'S REPORT.

The Treasurer, Sol. Runyon, presented his report since the last meeting, which showed the following exhibit:

Warrants paid—April 11, 1891.....	\$595 85
May 5, 1891.....	814 20
June 5, 1891.....	515 83
July 13, 1891.....	445 39
	<hr/>
	\$2,171 27
Total expenditures forty-second fiscal year.....	<hr/>
	\$12,525 36
Balance from forty-first fiscal year.....	\$26 02
Appropriation.....	12,500 00
	<hr/>
	\$12,526 02
Amount expended \$12,525 36, less \$1 overpaid.....	<hr/>
	12,524 36
Balance.....	<hr/>
	\$1 66

FORTY-THIRD FISCAL YEAR.

Warrants paid—July 13, 1891.....	\$1,342 62
August 6, 1891.....	814 00
September 16, 1891.....	584 55
October 3, 1891.....	1,366 68
	<hr/>
Total.....	\$4,107 85
Appropriation.....	10,000 00
	<hr/>
Balance unexpended.....	\$5,892 15

REPORT OF SECRETARY.

The report of the Secretary was then read, as follows:

To the honorable State Board of Horticulture:

GENTLEMEN: I beg to submit my report as your Secretary, since your last meeting held at San Francisco, April 15, 1891.

The forty-second fiscal year closed June 30, 1891, and the following are the expenditures for the year:

Library.....	\$275 95
Janitor.....	207 75
Rent.....	1,933 00
Stenographer.....	200 00
Postage.....	690 85
Sundries.....	187 27
Traveling expenses, Commissioners.....	1,131 39
Traveling expenses, officers.....	811 70
Office supplies.....	324 17
Repairs.....	234 30
Telegrams.....	61 45
Expressage, freight, and cartage.....	424 58
Publishing.....	2,085 30
Experimenting.....	2,634 30
Furniture.....	548 50

Papers	\$64 25
Salary, clerk	204 00
Salary, special agents	505 00
Total	<u>\$12,524 36</u>
Balance from forty-first fiscal year	\$26 02
State appropriation	12,500 00
Total	<u>\$12,526 02</u>
Expenditures	<u>12,524 36</u>
Balance	\$1 66

The annual reports of the Board for the years 1889 and 1890 have become entirely exhausted. The applications for these reports have by far exceeded our ability to supply, and postal cards had to be issued giving notice as to where the books can be seen for reference. The material for the coming 1891 report is now in course of completion, and we shall be ready to forward the same to be printed by the first of the year.

The field of investigation and experimentation having been so large, several bulletins have been issued to supply the desired information upon various subjects, as follows: "Olive Oil, its Uses and Adulterations" (Proceedings of the Olive Growers' Convention), five thousand copies; "The Peach Yellows; a Warning to Fruit Growers of the Danger of Introduction," five thousand copies; "Citrus Fruits," in two parts—Part I, "Lemon Curing;" Part II, "New Varieties of Citrus Fruits"—ten thousand copies; "Insects, Beneficial and Injurious; Remedies and Mechanical Appliances," ten thousand copies. The illustrations are mostly in colors, giving a better idea of the subjects therein treated.

The correspondence has greatly increased, perhaps due to new plantations and the many newcomers into the State who seek for information on many subjects pertaining to the fruit industry.

This year the work of this division has increased enormously, and several thousand packages of fruit were received and identified. Many new varieties of fruit have been examined, and illustrations made of those of any real merit, which will appear in special bulletins from time to time. The methods of processing are year by year advancing, and many mechanical appliances invented, which render the handling of the products, green and dried, much easier, and are great labor-saving devices. Various new methods have been illustrated in the several bulletins issued.

The deadly yellows that has ruined many of the peach-growing regions of the East was fully illustrated in a pamphlet, together with views of orchards ruined by it, to show the fruit men of the State what will be the result if it is introduced here. This bulletin has had a very beneficial effect, as the newspapers gave it wide publication, and dealers in Eastern trees have found it difficult to dispose of their goods, and several carloads that would otherwise have been sent here, having been so booked, were countermanded.

Never before has so many trees been imported into the State as this and last year. So far no trees or plants have arrived that are not free from insect pests. A shipment of three hundred and twenty-five thousand orange trees arrived from Tahiti with no less than nine different kinds of insects upon them; of these two were entirely unknown to this

coast and are very injurious, and proved hard to exterminate. One of these lives under the bark, and therefore cannot be killed with remedies. This cargo was placed in quarantine immediately upon arrival. The danger of introducing these pests being so great, proceedings were instituted before the Superior Court at Los Angeles. The Court, instead of ordering them destroyed, ruled that they must lay in quarantine till all insects upon them are dead. Since that time most of the trees have perished, and those that are still alive have been repeatedly treated by the owners, with only partial success in destroying the insects. The Attorney-General will soon institute proceedings, and it is to be hoped that the Court will order them destroyed.

This and many other cargoes that have arrived have required the personal attention of the Quarantine Officer, and a deputy was appointed temporarily to inspect all ships that arrive from foreign countries at San Francisco. At present we know of large consignments of trees that will begin to arrive soon from the East, and every precaution will be taken that no new pests be thus introduced. This division has, from time to time, issued such instructions and advice as occasion required.

Quarantine Guardians.

The following have been appointed Quarantine Guardians since my last report, and which commissions are now in force:

- April 13, Yolo County.—H. C. Howard, Inspector Woodland District.
- April 25, San Luis Obispo County.—E. B. Ketchem, R. M. Shackelford, and W. B. Prichard, county at large.
- June 1, State at large.—Ed. M. Ehrhorn, Deputy Quarantine Officer.
- July 16, San Benito County.—George S. Tremain, county at large.
- July 16, Orange County.—Hiram Hamilton, B. J. Perry, and I. N. Rafferty, county at large.
- July 17, Santa Cruz County.—J. A. McKune, C. Spreckleson, and D. M. Locke, county at large.
- August 7, Humboldt County.—C. C. Marshall, Inspector Eureka District; W. B. Shively, Inspector South Fork District.
- October 8, Ventura County.—W. I. Rice, J. F. McIntyre, and H. K. Snow, Jr., county at large.
- October 14, Los Angeles County.—John Scott, county at large; C. H. Richardson, Inspector Pasadena District; C. A. Coffman, Inspector Rivera District.
- October 24, Los Angeles County.—William Evans, Inspector Downey District; W. G. McMullen, Inspector Los Angeles District.
- November 2, Los Angeles County.—George A. Compere, Inspector Los Angeles District; T. B. Atkinson, Inspector Pomona District; Elmer Thomason, Inspector Azusa District; Charles Foster, Inspector Burbank District.
- November 10, Ventura County.—C. C. Elkins, Inspector Fillmore District; Rufus Touchton, Inspector Santa Paula District; Stephen Linton, Inspector Piru District.
- November 12, Fresno County.—J. R. Baird, George C. Roeding, and J. W. Watkins, county at large.

Executive Committee.

The Executive Committee has met as often as time permitted, and have allowed no work of the Board to be neglected. At times it has been impossible for them to meet, but they have been in steady correspondence, and have performed considerable work in this way.

On April 15th the committee met for the purpose of examining the books of the Secretary and those of the Treasurer, and to take an inventory of the property of the Board. They will no doubt present a report as to their findings.

At the meeting of July 9th the following was transacted:

RESOLUTION BY COMMISSIONER KIMBALL.

WHEREAS, The State Board of Examiners have signified their intention to disallow the payment of subscriptions to newspapers, journals, etc.; and whereas, we are in full sympathy with their action in the interest of economy; and whereas, the law establishing this Board (Section 8, Statutes 1883, p. 291, and as amended, in Section 8, p. 90), provides for the collecting of books, pamphlets, periodicals, and other documents containing valuable information relating to horticulture, and for the preservation of the same; the collecting of statistics and other information showing the actual condition and progress of horticulture in this State and elsewhere, etc.; and whereas, the newspapers subscribed to by this Board have been and are of great value and of great assistance to us in obtaining valuable information; and whereas, the cost of said papers, journals, etc., especially of scientific nature, does not exceed one hundred and fifty dollars per year; therefore, be it

Resolved, That we most respectfully request the honorable the State Board of Examiners to modify the resolution adopted by them June 12, 1891, with regard to newspaper subscriptions so far as relates to this Board, and that this Board have and will practice the utmost economy in the selection of only such papers and journals as are necessarily required to carry out the legitimate purposes of this Board.

Adopted.

The following resolution was also adopted:

Resolved, That a warrant for \$1,500 be drawn in favor of Albert Koebele, \$750 of which shall be paid to him in cash, taking his receipt therefor, and \$750 in form of a letter of credit to his order on some bank in Australia; and said Albert Koebele shall make monthly reports of expenses, and forward all vouchers therefor to this office.

The following resolution was also adopted:

WHEREAS, We are informed that some nurserymen, through the scarcity of peach stock for budding prunes, have contracted for large lots of Eastern peach stock for budding purposes for next season's delivery; and whereas, there is great danger of introducing into this State the "yellows," a deadly disease of the peach, on said roots, and on peach trees imported from the Eastern States, and while they may not now have the disease in the locality where they get this stock, yet we having no guarantee that the Eastern growers may not get trees grown in infested sections to supply the California demand from dangerous quarters; therefore, be it

Resolved, That we warn intending purchasers of the danger of getting trees affected with the "yellows" and other diseases and pests not now in this State; and be it further

Resolved, That we call the attention of all the Boards of County Horticultural Commissioners and Quarantine Guardians throughout the State to this danger, and to the rigid enforcement of the law in all such cases.

The date for holding the next Fruit Growers' Convention was fixed for November 17-20, 1891, inclusive, at Marysville.

The Secretary was instructed to request the members to make reports of the progress of the horticultural interests in their districts, and also the two Commissioners for the State at large, in accordance with previous custom and the law.

The propagating houses at San Gabriel have been moved on to new trees and stocked with cottony cushion scale, with which to feed the Vedalia through the winter months for distribution in the spring. This venture has proved a wise provision, and it is to these precautions taken that the preservation of this wonderful insect is due, as outside of these houses none have been found.

Respectfully submitted.

B. M. LELONG,
Secretary.

The report of the Secretary, as read, was approved and ordered spread in full upon the minutes of the Board.

QUARANTINE OFFICER'S REPORT.

The report of the Quarantine Officer was then read and ordered placed on file, as follows:

To the honorable State Board of Horticulture:

GENTLEMEN: Every steamship that has arrived from China, Japan, Australia, New Zealand, the Sandwich Islands, and Central America has been visited by me or my deputy and carefully inspected, to see that no plants or trees infested with injurious insects were landed by the passengers or crew. The ships' manifests were also examined, and whenever trees or plants were found the same were examined and disinfected, as a precautionary measure, and, in several cases where the trees were infested with known destructive pests, they were destroyed. The Japanese, and other firms importing trees and plants, were cautioned and instructed to notify their consignors to carefully inspect their shipments before sending to this country; otherwise, if found infested upon arrival they would be subject to seizure. This had a salutary effect, for subsequent importations were remarkably free from insects. I have made arrangements whereby we are notified by the Custom-house officials of the arrival of any plants or trees by sailing ships. I took this precaution, as one small lot of trees arrived in the spring that for a time escaped my notice. The arrival of sailing vessels is so uncertain that it is difficult to keep track of them.

The importation of three hundred and twenty-five thousand orange trees from Tahiti, which arrived at San Pedro June 15th, and specially referred to in my report to you dated August 31st, are still detained in quarantine, as the owners have failed to destroy the formidable "mining scales" that infested the trees, and have survived five fumigations with hydrocyanic acid gas. As I was advised to remain with the trees and prevent the distribution of any new pests into the orchards of the State, I could not leave there until the Court enjoined the owners from removing the trees. I have recently been informed by John Scott, Horticultural Commissioner of Los Angeles County, that one half of the trees died and were burned, and that the balance were dipped in Little's "Anti-Pest," one gallon to fifteen of water, on September 22d, and that upon inspection September 30th, the trees were slightly injured, but the "mining scales" were still alive; and upon October 13th he again inspected them, with the same result, and he has come to the conclusion that nothing will kill the mining scales without killing the trees.

In May we were advised that two species of caterpillars were doing considerable damage in the prune, cherry, and apricot orchards in the neighborhood of San José. I immediately visited the section and found the trees badly infested with *Anisopteryx autumnata* and the forest-tent caterpillar (*Clisiocampa sylvatica*). It was then too late to make satisfactory experiments for their suppression, as they had almost completed their growth; however, enough was done to prove that they can be checked or exterminated with Paris green, one pound to two hundred gallons, but to save the trees from injury it must be applied immediately after the young hatch. The former species can be prevented from ascending the tree to deposit her eggs in the fall by placing bands upon the trunks. Instructions in regard to this have been printed and distributed.

In my investigations of the Sacramento hop fields, after Mr. Lelong received the information that certain yards were infested with the destruct-

ive hop louse (*Phorodon humuli*), I failed to find the pest. The only insect upon the hops was the grain aphid (*Siphonophora avenæ*). In the same vicinity I also found the cabbage louse (*A. brassica*) and the plum aphid (*A. prunifolia*). The importation into hop-growing regions of hop roots from Oregon or Washington should not be allowed. There is also danger in importing plum or prune trees from the same States, as the winter eggs of the hop louse are deposited upon such trees.

No new species of scale insects have been found upon our fruit trees, and old pests and their life-histories are better known and remedies for their extirpation better understood and applied.

I had an opportunity to visit Tulare County recently, and found the trees that two years ago were seriously infested with San José scale now practically clean, and the trees healthy and vigorous. This condition I have observed in several orchards near San José.

J. W. Mills, of Yuba County, reports that a number of old apple trees in his district that have never been sprayed are now quite free from pernicious scale. In other sections, however, this scale appears as baneful as ever.

The red scale (*A. aurantii*) is still exempt from any internal parasite in California, but citrus culture in sections where it exists can now be profitably carried on by annually spraying or gasing the trees.

The parasite of the yellow scale in the San Gabriel Valley has kept the scale in check so much as not to be feared.

An internal parasite of the apricot scale has made its appearance at Berryessa, in Santa Clara County, which, it is to be hoped, will prove a check to this foe of the apricot and prune trees. Fully 90 per cent of the scales were parasitized. Next season, at the proper time, I will colonize this species in other sections where this scale is troublesome.

I learned in the spring of an internal parasite that destroyed the grasshoppers around Carowa, in New South Wales, and immediately addressed letters to J. P. Buggy, to secure colonies for California. In answer thereto I received a very interesting letter, dated June 1st, giving a very encouraging account of the work of the parasite, the successful introduction of which would be worth millions of dollars to this State alone. It was then too late to obtain them, as they are only found when the grasshoppers are out, that is, January to March in Australia. He has promised to secure them for us, and I have also written Mr. Koebele to visit that section and call upon Mr. Buggy.

The propagation of the Australian ladybird at San Gabriel has been very successful the past season, and the houses have again been stocked with cottony cushion scale to supply food for the *Vedalia* through the winter. The importance of this precaution by the Board has been favorably commented upon by the press and other publications in this country and Europe. The necessity of constant vigilance is evident from the fact that as soon as the *Vedalia* destroy all the *Icerya* in sight they disappear or die, and the experience in every case has been the reappearance of the scale a few months later, bred from scales the *Vedalia* could not reach. My attention was called by Scott Chapman, of San Gabriel, last spring to a colony of cottony cushion scale parasitized with *Lestophonus icerya*, the little dipteran that was introduced from Australia prior to the *Vedalia*. This is very remarkable, as it has had so very few scales to breed upon.

A colony of Coccinellidæ was received from Mr. Koebele when at the Sandwich Islands. The box containing them was placed in the refrig-

erator and they came through in good order. They were liberated at Mountain View, in Santa Clara County. This species preys upon Lecaniums and on the larvæ of other scale insects.

Last winter a carload of peach trees was received at Tulare from New Jersey, and planted in orchard form. One orchardist who planted part of the consignment became alarmed at the yellow and stunted appearance of some of the trees, and reported his fears to this office on October 15th. I immediately visited his place and investigated the matter. The trees he referred to I found were planted upon a sandy portion of his place, and during the extreme hot spell in July the trees had been irrigated by the basin system, the water coming in contact with the young stems; and the basins having been allowed to remain without cultivation, the bark was scalded close to the ground, completely girdling the trees. This stopped the flow and return of sap and gave the trees the sickly appearance. In justification to the owner I will state that he was absent from home during the irrigation, and the superintendence of the work was intrusted to others.

I also visited the other orchards planted from the same shipment, and found most of the trees in apparently good condition. However, I think it will be advisable to carefully inspect the trees when they start in the spring, as they came from a State known to be affected with the "yellows."

The laws relating to insect pests and diseases, in their present form, are more effective than formerly, but yet lack a clause that would give the proper authorities the power to condemn and destroy imported trees when found infested with dangerous diseases and insect pests, without having to bring an action before the Courts to declare them a public nuisance and to order them destroyed. Such a clause would have a wholesome effect in checking the wholesale importation of cheap, diseased, and pest-infested nursery stock from all parts of the world.

The uncertainty of destroying all pests by disinfection, and the impossibility to cure trees having the dreaded "yellows," should be sufficient grounds for the passage of such a law. The delay in the suit for the condemnation of the cargo of orange trees from Tahiti, which arrived on the fifteenth of June last, and which are still held in quarantine, as the owners have failed to destroy all the pests thereon, is more proof of the necessity of further legislation for the protection of the horticultural industry of the State. Such a law need not debar the importation of trees or plants for experimental purposes; but it should be obligatory upon the importers to notify some one in authority of the arrival of such trees or plants, and a careful inspection made before the trees are planted.

The law does not now require notice to be given of the arrival of trees or plants, and should they escape the vigilance of Horticultural Commissioners, or be received in counties that have failed to appoint inspectors, nothing would prevent their being distributed. This is a very serious defect and should be remedied as soon as the Legislature meets, as the importance and utility of such a clause cannot be questioned. Had such a restriction been in force in the past, there would have been no occasion for the introduction of parasites, or the annual expenditure of thousands of dollars in fighting insect pests.

ALEXANDER CRAW,
Quarantine Officer.

REPORT OF EXECUTIVE COMMITTEE.

The report of the Executive Committee was then read, as follows:

To the honorable State Board of Horticulture of California:

Your Executive Committee met in the office of the Secretary, at the rooms of the Board, on the eighth and succeeding days of July, 1891, and carefully examined and compared the books, accounts, bills, vouchers, and records of the Secretary, and also inventoried all the property in control of the Board, including office furniture, fixtures, library, etc., and beg to submit the following thereon for your consideration:

First—The period over which our examination extended began February 25, 1890, and terminated July 8, 1891.

Second—We found the books of "original entry," embracing the period named, to fully exhibit all disbursements of the Board and for what purpose made. Each and every bill was compared with the entries made, and found to be correct in every particular, and, on comparing vouchers with bills, all were found to correspond, and all were paid.

Third—The expenditures of the Board for the fiscal year ending June 30, 1891, were as follows:

Expenses of members of the Board attending two Conventions and expenses of Executive Committee attending two executive sessions	\$1,131 39
Expenses incident to two Conventions, including pay of Stenographer and traveling expenses of Secretary and Clerk	1,018 35
Rent	1,755 00
Incidental office expenses	473 52
Addition to furniture, carpets (including repairs on same), fitting up hall for Board and public meetings, steel office safe, rearranging rooms to properly accommodate the increased and rapidly increasing business of the Board, together with materials, lumber, sash, glass, doors, carpenter's and painter's work required in making said alterations and additions	782 80
Postage stamps	690 85
Additions to library	269 70
Drawings, engravings, electrotyping, translations for report of 1890, printing bulletins, and miscellaneous printing	2,082 10
Janitor	176 75
Messenger	172 00
Experimenting, including purchase of all materials and chemicals, fruits for experimenting, purchase and transportation of parasites, building glass houses for propagating <i>Vedalia cardinalis</i> and other parasites	2,623 85
Telegraphing	58 20
Express, freight, and cartage	365 61
Special agents	417 60
Subscriptions to papers and journals	61 25
Total amount of bills paid and journalized	\$12,078 97

The following bills, for which warrants had been drawn but not yet journalized, were also examined and found correct:

Deputy Quarantine Officer Ehrhorn	\$78 00
Alex. Crow, Quarantine Officer, traveling	36 85
Dutton & Partridge, account books	18 60
Packing-boxes	13 77
J. Caire, chemicals	8 90
Crocker & Co., printing	2 00
Chas. Reidy, lamps	29 50
Rent	135 00
Total	\$317 12

In addition to the above there were a few bills pending before the State Board of Examiners, which, if passed, would amount to the full appropriation of \$12,500.

A careful consideration of the valuable work done for horticulture through the medium of the State Board of Horticulture, and the vast field for still more valuable and extensive work, which may and should be done through the Board, prompts your committee to recommend that such action should be taken as will secure from the next Legislature appropriations commensurate with the importance of the work to be accomplished, to the end that exact information may be obtained as to the best methods for successfully prosecuting all horticultural pursuits, and when so obtained and published, that a sufficient number of copies be printed to secure the widest distribution, thereby saving vast sums of money which would otherwise be squandered in useless and fruitless experiments.

The annual reports of the State Board of Horticulture are every year marking a higher standard of excellence, and, as every year is a year of horticultural progress, so should the literature of horticulture correspondingly advance.

Again we take pleasure in saying that at the close of another year we find the work of our Secretary well done, and, although more work has been demanded of him during the past year than ever before, yet we find no portion neglected; he has fully sustained his reputation for successful and satisfactory administration of his office.

FRANK A. KIMBALL,
ELLWOOD COOPER,
J. L. MOSHER,
Executive Committee.

The report of the Executive Committee as read was adopted by unanimous vote, and ordered spread in full upon the minutes of the Board.

AMENDED REGULATIONS.

The following regulations were then adopted, amending the regulations adopted June 29, 1889:

I. All consignees, agents, or other persons shall, within twenty-four (24) hours, notify the Local Inspector or Quarantine Guardian of the arrival of any trees, plants, buds, seeds, pits, or cions, at the first point of debarkation in the State of California.

II. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions imported or brought from any foreign country, or from any of the United States or Territories, are hereby required to be disinfected immediately upon arrival at any point where they are to be unloaded; and furthermore, if any of said trees, plants, cuttings, grafts, buds, seeds, pits, or cions are found infested with insects (or their germs), or with any fungi, blight, or other diseases injurious to fruit or to fruit trees, or to other trees or plants, they shall remain in quarantine for a period of fourteen (14) days, or until the Quarantine Officer, Quarantine Guardian, Local Inspector, a State Commissioner of Horticulture, or County Horticultural Commissioner can determine whether the said trees, plants, cuttings, grafts, buds, seeds, pits, or cions are free from injurious insect

pests, or their eggs, larvæ, or pupæ, before they can be offered for sale, gift, or transportation, as hereinafter provided.

III. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions infested with any insect or insects (or their germs), fungi, blight, or other diseases that are known to be injurious to fruit or to fruit trees, or to other trees or plants, and liable to spread contagion, are hereby required to be disinfected before removal for distribution or transportation, or before being offered for sale or gift.

IV. All peach, nectarine, apricot, plum, prune, almond, or other trees budded or grafted upon peach or other stocks or roots, and all peach or other pits, cuttings, buds, or cions, raised or grown in a district where the "peach yellows" or the "peach rosette" are known to exist, are hereby prohibited from being offered for sale, gift, distribution, or planting within the State of California.

V. Fruit of any kind grown in any foreign country, or in any of the United States or Territories, or in the State of California, and found infested with any insect or insects (or their germs), or with any fungi, blight, or other diseases known to be injurious to fruit or to fruit trees, or to other trees, are hereby prohibited from being offered for sale, gift, or distribution.

VI. Transportable material of any kind, infested by any insect or insects (or their germs), or by any fungi, blight, or other diseases known to be injurious to fruit or to fruit trees, or to other trees, and liable to spread contagion, is hereby prohibited from being offered for sale, gift, distribution, or transportation, until said material has been disinfected by dipping it in boiling water and allowing it to remain in said boiling water not less than two minutes; such boiling water used as such disinfectant to contain in solution not less than one pound of concentrated potash to each and every ten gallons of water.

VII. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall be disinfected by dipping in a solution of one pound of whale-oil soap (80 per cent) to each and every gallon of water; said whale-oil soap solution shall be kept at a temperature of 115 to 120 degrees Fahrenheit. Said trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall remain in said solution not less than two minutes. After said trees, plants, cuttings, grafts, buds, seeds, pits, or cions have been disinfected, they shall remain in quarantine fourteen (14) days for subsequent inspection, if deemed necessary by a State Commissioner of Horticulture, County Horticultural Commissioner, Quarantine Officer, Quarantine Guardian, or Local Inspector, for further disinfection.

VIII. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall be disinfected by fumigation with hydrocyanic acid gas, as follows: Said trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall be covered with an air-tight tent, or box, and for each and every one hundred cubic feet of space therein, one ounce of fused cyanide of potassium (58 per cent), one fluid ounce of sulphuric acid, and two fluid ounces of water shall be used. The cyanide of potassium shall be placed in an earthenware vessel, the water poured over the said cyanide of potassium, afterwards adding sulphuric acid, and the tent, or box, to be immediately closed tightly, and allowed to remain closed for not less than forty minutes. After said trees, plants, cuttings, grafts, buds, seeds, pits, or cions have been treated with hydrocyanic acid gas, as above directed, they shall remain in quarantine for fourteen days, for subsequent

inspection, if deemed necessary by a State Commissioner of Horticulture, County Horticultural Commissioner, Quarantine Officer, Quarantine Guardian, or Local Inspector.

IX. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions imported or brought into the State shall be inspected upon arrival at first point of debarkation, and if found infested with injurious insects which have not been destroyed by the remedies required by Rules VII and VIII of these regulations, they shall be proceeded against as a nuisance.

X. Any person or persons having in their possession any trees, plants, cuttings, grafts, buds, seeds, pits, or cions infested with any insect or insects (or their germs), or with any fungi, blight, or other diseases injurious to fruit or to fruit trees, or to other trees or plants, and who refuse or neglect to disinfect the said trees, plants, cuttings, grafts, seeds, buds, pits, or cions, as required by Rules VII and VIII of these regulations, after having been notified to do so by a State Commissioner of Horticulture, or County Horticultural Commissioner, Quarantine Officer, Quarantine Guardian, or Local Inspector, the said trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall be declared a public nuisance, and shall be proceeded against as provided by law.

CHAPTER II.

COMMISSIONERS' REPORTS.

REPORT OF F. A. KIMBALL,

Commissioner for the State at Large.

To the honorable State Board of Horticulture:

GENTLEMEN: In conformity to a resolution adopted by the Executive Committee, "that each member report the condition of horticulture in his district," I hereto append my report as Commissioner for the State at large.

Developments in horticulture which have taken place during the few years last past have been so unprecedented that little more than allusion can be made to the varied and various industries properly classed as departments of horticulture.

My personal observation during the past quarter of a century nearly, has been more particularly directed to the portion of the State lying south of Point Concepcion, and still more particularly to the county of San Diego, a territory embracing an area nearly equal to that of New Hampshire and Vermont combined.

In 1868 her catalogue of fruits included two orange trees, one apple, a few trees bearing a fruit which, from its form, was known as a pear, half a dozen date palms, a pomegranate hedge, and a few scattered shrubs, about four hundred olive trees, three hundred and forty-seven of which comprised the orchard planted by the Mission Fathers subsequent to the year 1769, and three small vineyards of Mission grapes, situated about fifty miles apart.

The counties of San Bernardino, Los Angeles, and Santa Barbara were much further advanced, horticulturally, particularly in the cultivation of the orange, lemon, walnut, and olive, which were shipped from these counties in sufficient quantity to be quoted in the market reports.

Planting of fruit trees had long since ceased, or so nearly that a young tree of any variety was a rare sight, as it was then considered that further planting would only result in glutting the market, which was little else than local—transportation facilities being confined to one steamship line, making one trip per month, with freight rates absolutely prohibitory. Nearly the entire southern half of the State was a vast stock range, and the counties comprising it were denominated, by their more aristocratic neighbors, as "cow counties."

These conditions had existed for many years, and were a bar to an influx of population till, in the fullness of time, the revolving cycle had again reached the point when these barriers must be broken down and the latent resources of the country developed, to the end that the increasing number of inhabitants should be provided with such subsistence as the generally improved and improving condition of the

people demanded. "Frijoles" and "jerked beef" could no longer constitute the larger part of the every-day diet of the people. Horticulture was soon to revise the "bill of fare."

The knowledge of the value of this, at *that* time almost unknown region, spread rapidly; natural and artificial obstructions were removed by the increasing population—increased mainly by immigration of people totally unused to existing conditions. These immigrants brought with them ideas born of an environment naturally similar to their new surroundings, and no time was lost in putting them into practical operation.

Soon "sagebrush and cactus" disappeared, and "fruits good for food" occupied their places, and where a few years before there was but one family, badly housed and worse fed, *now* hundreds of families are living in absolute comfort, surrounded with luxuries which unlimited wealth, under less favorable circumstances, cannot procure. All this change has been wrought by a simple change of pursuits; in the one case accepting what nature chose to offer, in the other demanding all she could produce.

To horticulture alone is this change to be ascribed. True, heretofore a subsistence was gained, but not of a character which excited the intellect to exertion for its cultivation and consequent elevation; it did not induce a demand for school houses, churches, social societies, good roads, or any roads at all; in fact, society itself was in just the condition which its surroundings created.

In the other or present case, we find the new conditions have created a demand *for*, and the country is now dotted over *with*, school houses and churches, social organizations are almost without number, and a condition of society exists of which any country might justly be proud; and horticulture is the foundation on which it all rests.

Take away horticulture and the industries dependent upon it would soon fade from sight, and a few years would see our school houses without scholars, our churches without pastors or people; society would hold its meetings in the saddle, with a riatta suspended at one side and a revolver at the other; and our *roads* would be reduced to trails; in fine, the days of "frijoles" and "jerked beef" would return and the country would lapse into its former condition.

Little more than allusion can be made to our phenomenal growth in population, and the more than phenomenal growth which will give California at fifty years of age a position as far advanced as that of other countries which have celebrated their second centennial.

Would we continue this upward march to supremacy, we must provide the means whereby it may be attained; by this I mean that every aid to horticulture must be brought into requisition.

Possibly a shade of disappointment may pass through the mind of one of our most advanced horticulturists, should he chance to see a record of his prophecy made in 1884, and recorded in the report of the State Board of Horticulture of that year, from which I quote:

Our home market is more than supplied. The reduction of freights, in some distant future, to the northern Territories and the East will undoubtedly help the market. The production of plums, prunes, and apricots has now reached such dimensions as to cause the anxious inquiry on every side as to what shall be done with the vast product *now* produced and the thousandfold increase of the near future. Pears, owing to the blight, are needed to supply some parts of the East, but Arkansas, Kentucky, Tennessee, Northern Georgia, and the Western Carolinas and Virginia can produce pears sufficient in ten years to supply the world. The Yankees will have to eat their own pippins, drink their

own cider, and eat their own canned and dried fruits. The margin of soil and climate is in our favor, as against the Eastern grower; but that it is our mission to supply the East, South, and West, and the whole world with fruit is a preposterous idea that the future will soon dispel. Europe, with her cheap labor and experience, can furnish the whole world with prunes at 4 cents per pound, and become rich. Spain, Greece, and Italy will be glad to supply all christendom with raisins for their plum puddings at almost as cheap a rate, and the ocean is their highway, while *we* must pay a proscriptive toll on the way to *our* market.

The planting of orchards and vineyards should correspond with the supply needed on this coast and the probable demand for Eastern and foreign consumption. An area of plums, prunes, and apricots is *already* planted more than sufficient to supply the demand for twenty years.

As a *prophet*, the writer above quoted has not proved a success, as has been proved, by the area then planted having been many times multiplied and the *demand* for the products of horticulture has increased at a greater ratio than has the area planted. Statements like the one quoted, from such high authority, have had a tendency to make timid those whose opportunities for obtaining facts in relation to horticulture were confined to a narrow range; yet horticultural developments have wonderfully progressed in face of all the failures predicted; notably in the case of Riverside, from whence were exported in 1884 *fifty* carloads of oranges and lemons, and in 1890 fifteen hundred carloads were shipped.

More recent plantings, not only of citrus, but of all other fruits and nuts, in various sections in all the counties denominated as Southern California, have developed the same astonishing increase in output of products, and it appears from careful investigation that no particular county in the section of the State under consideration, nor any particular section of any county, can claim a monopoly of resources, though in many cases only partially developed, yet such progress has been made in all sections as to warrant the prediction that to persons inclined to horticultural pursuits it is quite a matter of personal preference, or perhaps fancy, in what section he shall cast his lot.

Very much of the progress to be seen on every hand may be attributed to the better understanding of "*the what*" and "*the how*" to do, and not a little of the requisite knowledge has been acquired through the great number of Conventions of fruit growers and the accompanying friendly competitions to decide *where* the best fruit was grown and who grew it.

Many of these Conventions have been held under the auspices of the State Board of Horticulture, and the proceedings have been widely distributed through its publications, which, with the vast amount of information brought together from other sources, has unquestionably been a large factor in elevating this vast area, comprising almost half of the State, from a stock range, with land valued but little above the government price, to a productive capacity which *pays* the interest at 6 per cent per annum on not alone \$1,000 per acre, but instances are not wanting where 10 per cent per annum has been realized on \$10,000 per acre, which statement is made without qualification.

The profits to be derived from horticultural pursuits are to be affected by rates of freight, and it is confidently believed that a gradual reduction will take place; if not otherwise, then by the introduction of competing lines of railroad, which will help to compensate for any reduction in price of fruits, should such occur. Other compensations for a retreat in average prices of fruits will be in improved methods of cultivation, stimulating fertilizers, and improved varieties.

To the end that every element which will tend toward increasing our powers of competition may be considered, I wish to strongly recommend to the fruit growers of the State that every influence be brought to bear on our law-makers that the powers of the State Board of Horticulture shall be so enlarged, and such specific requirements shall be made, as will place within reach of every fruit grower such information as will prevent mistakes in planting, so that the cherry would not be planted where the prune should be planted, nor the orange where the apricot should be planted; that a fruit which will not succeed in a northerly exposure should not be planted there; that domestic and commercial fertilizers should be analyzed, and the results made accessible.

I am willing to say that I believe there is no other industrial pursuit which absolutely requires intelligence in so high a degree as does horticulture, nor is there another field so large. Is there another man who labors who has so untiring a helper as nature? There are difficulties to be encountered by the horticulturist which are unknown to the skilled mechanic. The State should educate him. I would have a copy of each and every State Horticultural report in every school library in the State.

I have purposely avoided reference to localities, there being so many in every county to which reference could be made with satisfaction and pride, that to leave out one would be not only unfair, but unjust, and to name them all, with the particular and peculiar advantages of each, would extend this report beyond all proper limits.

REPORT OF J. L. MOSHER,

Commissioner for the State at Large.

To the honorable State Board of Horticulture:

GENTLEMEN: The growth of the fruit industry is phenomenal; in fact, it is the leading industry, and it seems to be the efforts of our fruit-growing people to combine to improve and bring this industry to the very highest standard, this being done in perfect unison. There are no secrets kept from the public. In fact, those commencing new in the business are warmly welcomed and the advantages of past experience readily given. In no other industry is the right hand of fellowship so warmly extended.

I have visited the orchards in many counties, and everywhere is the work of horticulture rapidly advancing. In most every fruit section horticultural societies have been organized; and by meeting monthly, fruit growers are enabled to compare notes and profit by the experience of their neighbors, by an interchange of ideas, etc. They are also better able to ascertain information outside of their respective localities, greatly to their benefit. San Diego County is entitled to much praise in this respect, as there are twenty-eight organizations of this kind in that county, holding weekly and monthly meetings, and all meet in general convention every three months. Thus the questions considered in their weekly and monthly meetings are brought before the general assembly for action.

A horticultural society for the southern district has been organized, with headquarters at Los Angeles, and is doing much good in the advancement

of horticultural pursuits. However, before the organization of that society, and many years before, a pomological society was organized, which is still in existence, and meets at different places during the year, enabling fruit growers to come together often and discuss matters of vital importance to their industry. County and local societies also exist in San Bernardino, Santa Barbara, Ventura, Orange, and San Luis Obispo Counties. Kern, Tulare, Fresno, Stanislaus, San Joaquin, Amador, Sutter, Butte, Tehama, and Humboldt have similar organizations, and much interest is manifested in them. Solano, Yolo, Napa, Sonoma, Alameda, and Santa Clara also have active societies, which, from the reports of their meetings as given in the various journals, are doing much good and imparting valuable and useful information. And last, but not least, the State Horticultural Society, with headquarters at San Francisco, enables fruit growers near the bay to meet monthly, and very important matters are considered from time to time. Almost every fruit-growing county now has a Board of County Horticultural Commissioners, and they are doing most excellent work, and are highly to be commended, and the State has been largely benefited from the results of their labors.

Santa Clara, one of the largest fruit-producing counties, has been the most dilatory in the appointment of Inspectors and Commissioners, but now seems to see the benefits of such appointments, and is pushing forward with energy. The Board of Supervisors have passed stringent quarantine ordinances, and seem anxious to do everything to advance the fruit industry.

There has been a persistent endeavor to ship into our State infested fruit and other trees, but the defiant expression of the people and the press, the energy, zeal, and exertion of our State Quarantine Officer, County Horticultural Commissioners, and Boards of Supervisors, have enabled us to prevent the planting of large importations by placing them in quarantine upon arrival, and many of which have been destroyed.

I think it is to the interest of the people to also know that Eastern trees do not thrive in California as the home-grown trees do, on account of the quality of the trees, climate, soil, or long transportation. I was invited to visit an orchard in the eastern part of the State, as it was not doing well. On inquiry I found they were Eastern trees, bought from traveling agents. The trees bought for prunes turned out to be plums, and a large portion of the peaches were dead and dying, although they were on rich soil and well cultivated.

My own experience proves that Eastern trees do not thrive well here. Several years ago I bought trees of a home nursery. They were sold to me as California grown, but I afterwards found they were Eastern trees. They did not do well under the most careful attention, some dying, others partly dying, and I had to keep replacing, until after four years I have taken out the last tree.

Probably one of the most important measures at the present time, is the movement to have the freight reduced on all boxed dried fruit to all Eastern points. At the present time the bulk of our dried fruit is shipped in sacks, the larger portion of which upon arrival in the East is repacked in boxes and put upon the market under all kinds of brands. If the freight could be reduced enough so that the fruit in boxes could be delivered in the East as cheap as in sacks, nearly if not all the fruit

would be shipped in boxes, under the grower's or packer's own brand. This would guard against the many frauds that may be perpetrated. It would also be an impetus to growers and packers to put up their fruit in good and attractive form, and would also command better prices. If people could see the fruit that is shipped in sacks on its arrival East, the sacks badly worn (and often torn) from the hundreds of miles of travel, and the fruit thick with sand and dust, they would hardly recognize it. There are many other reasons why dried fruit should be shipped in boxes. I am certain that if this matter is brought before the railroad companies in the proper form, they will readily see that it is to their advantage, and the desired reduction will be obtained, to the great benefit of California.

REPORT OF I. H. THOMAS,

Commissioner for the San Joaquin District.

To the honorable State Board of Horticulture:

GENTLEMEN: Your Commissioner for the San Joaquin District respectfully reports that he has recently visited the principal points of his district where horticulture is made the leading industry, and was pleased to find everything in the horticultural and viticultural industry lines prosperous; not alone this, but the agricultural development of the San Joaquin Valley (which is two hundred and fifty miles long and an average of ninety miles in width) has been both remarkable and phenomenal.

Hundreds of miles of irrigating ditches have been constructed in the valley during the past year, and by the aid of water thousands of acres of land that have heretofore been known as desert have been made to blossom as a rose.

Where systems of irrigation have been introduced lands have been subdivided into colony lots, thus enabling men of limited means to secure homes of their own, where they can abide in happiness under their own "vine and fig tree."

With increase of population have come commodious school houses, and no like area in the world with equal population is as well supplied with commodious school houses, where the colonists' children can have the advantage of a good education, and thus become intelligent American citizens.

Fresno County has undoubtedly made the greatest material progress during the year. Statistics show that it required over two thousand cars to move their products during the past year, and it is estimated that the raisin yield this season was over two million boxes, and the value of her exports for this year will be near \$10,000,000.

Tulare County follows close to Fresno County in progress, and her growth during the last three years has been very remarkable. From the present outlook her acreage of trees and vines will be more than double in the next two years. Considerable attention is being given to the growth of oranges and lemons, which are found to do well in the foothills and along its borders. Porterville has already attained a wide reputation for her oranges. Lemons are found to be a very profitable crop in several places, and seven hundred acres of the "Cove Ranch," eighteen miles east of Visalia, have been subdivided into colony lots,

where this fruit will be propagated on a large scale, experience having proved the land and climate especially adapted to their cultivation.

Kern County has also awakened to her possibilities, and by the adoption of the colony system for populating her lands, is making rapid progress in horticulture. Orchards and vineyards planted in the last year or two have made a surprising growth, and the quality of fruit produced cannot be excelled anywhere in the State.

Merced and Stanislaus Counties have a large acreage adapted to fruit trees and vines, and when the system of irrigation now in progress in those counties has been completed, and water spread over their rich lands, they will not be behind their sister counties of the San Joaquin Valley in the production of fruits and raisins.

They have the soil, which only needs the revivifying influence of water, which can be easily obtained through a system of canals and ditches.

There are yet enough of uncultivated lands in the valley, that can readily be placed under a system of irrigation, to supply comfortable homes for one million families, and these lands can be secured to-day at prices varying from \$30 to \$100 per acre.

Three lines of railroads paralleling each other pass almost through the entire length of the San Joaquin Valley, all under the control of the Southern Pacific Railroad Company. These roads furnish better transportation facilities, so far as accessibility for the producer is concerned, than are found in other portions of the State, none of our products having to be hauled a great distance to reach a railroad station.

The "West Side" Railroad, lately completed between Tracy, San Joaquin County, and Armona, Tulare County, opens up a large extent of very productive country. This road will soon be extended south from Armona, leaving Bakersfield seven miles to the east, and forming a junction with the main line at the head of the valley, near Caliente Creek. This will open up an extensive body of fine fruit land that is now lying idle.

One tract of land on this new line, known as the "Weed Patch," fifteen miles south of Bakersfield, and consisting of two hundred thousand acres of good land, will soon be supplied with irrigating ditches. This accomplished, and there is no reason why this particular section should not become the home of the orange and the fig, as well as of other fruits.

The soil in the San Joaquin Valley is so varied that localities can be found in parts of it for the growth of citrus as well as deciduous fruits. There is a thermal belt extending along the entire eastern side of the valley, and the growing of oranges, lemons, limes, as well as of stone fruits, has proved a success there. Oranges are grown with success in the foothills east of Fresno, at Orosi, Kaweah, and Portersville, in Tulare County. At the latter named place a large acreage has been devoted to citrus fruits, and the success met with in their culture is inducing the planting of a much larger acreage.

This section is also well adapted to deciduous fruits.

The best lands found for the growth of stone fruits, so far, are embraced in the reclaimed swamp land found near Bakersfield, Hanford and vicinity, and at Visalia.

I am pleased to report that the vines and trees growing in my district are generally in a healthy condition, the pernicious scale being a thing

of the past, leaving only the red spider and the codlin moth to contend with, and these can be easily conquered by the use of the remedies recommended by the State Board of Horticulture.

REPORT OF A. BLOCK,

Commissioner for the San Francisco District.

To the honorable State Board of Horticulture:

GENTLEMEN: The condition of horticulture in the San Francisco District is in most respects favorable. The general financial results to growers during the fruit season of 1890 were such as to greatly stimulate the planting of trees, and the demand for the product of the nurseries was unprecedented, leading, in many cases, to the importation of trees from Eastern nurseries, mostly peaches, but prunes also to a limited extent, grown in the East on special contract. These Eastern trees were in most cases well grown and of fair appearance. A search, however, disclosed the presence of a limited number of the Eastern peach-root borer, which differs in some very small particulars from the Pacific peach-root borer, which is found in some places within the district. Active measures were inaugurated to disinfect the trees by dipping in hot soap solution, with only partial success. Warnings were given by the local horticultural journals, and personal inspection was so close that it is not believed this pest was introduced. The danger, however, is so great, not only in case of the borer, but of the plum curculio and the peach yellows, that some effective measures should be taken to prohibit the use of nursery stock from sections of the country liable to be troubled with yellows or curculio.

Santa Clara County has attained much prominence by the extent of its orchards. The following figures, giving the number of fruit trees at present in the county, made up from private memoranda, may be considered tolerably accurate:

	Bearing.	Not Bearing.
Apples.....	55,000	20,000
Apricots.....	240,000	150,000
Cherries.....	72,000	50,000
French prunes.....	400,000	375,000
Plums.....	65,000	25,000
Peaches.....	250,000	285,000
Pears.....	60,000	30,000
Quinces.....	4,000	-----
Olives.....	6,500	7,000
Oranges.....	3,000	1,000
Lemons.....	300	200
Limes.....	200	-----
Figs.....	1,000	1,000
Almonds.....	12,000	8,000
Walnuts.....	1,000	700

Strawberries, 260 acres; blackberries, 62 acres; raspberries, 40 acres.

The product of the orchards for the present year is more difficult to ascertain than usual, on account of the great amount of dried fruit still scattered among the growers who have dried their own. There are prob-

ably not less than 25,000,000 pounds of green apricots, possibly 30,000,000; of French prunes, not less than 40,000,000 pounds of green fruit; of peaches, 26,000,000 pounds; of cherries, 7,000,000 pounds; of pears, 5,000,000 to 7,000,000 pounds; of oranges, 4,000 boxes. There are many things which convince me that these estimates are much below the actual production, for the local use is very large, and the channels through which it passes are numerous and varied.

The condition of the district is very favorable as regards insect pests. Three years or more ago considerable alarm was felt at the rapid increase of the cottony cushion scale, all sorts of trees becoming infested, such as roses, ivy, walnut, locust, deciduous fruit trees of almost every kind, while citrus fruits were being abandoned. The introduction of the *Vedalia cardinalis*, and its distribution by public-spirited citizens, has practically removed this pest, and, at a late date, only a very few were known to exist; some of these have been supplied with the *Vedalia*, and no danger is feared. I can truly commend the action of the State Board in carefully breeding this valuable scale destroyer.

The pernicious scale, so prevalent and dangerous a few years ago, has almost entirely disappeared, and we think no district within the State is now so free from this pest as the region round about San José. The agent of destruction in this case is undoubtedly the twice-stabbed ladybird.

Serious results from codlin moth can always be prevented by seasonable spraying. The canker worm and one or two sorts of leaf-eating caterpillars caused considerable damage. Among other remedies proposed against these I should desire to see further experiments made with white hellebore, which I have tried, but not sufficiently to be entirely satisfied. It seems to promise much.

The pests giving most trouble the past season are the apricot scale (*Lecanium armeniacum*) and the black scale (*Lecanium olea*), the latter appearing on plum, prune, and apricot on the west side of the Santa Clara Valley, and evidently injuring the trees materially. The sprays used against these have not been as effective as they should be, and I recommend special attention and work to discover something better. The plum aphid has troubled more than in many years before, there being quite a notable absence of their natural enemies.

The twice-stabbed ladybird, when present in large numbers, reduces the apricot scale materially, and another parasite has thinned them out in some portions of Santa Clara Valley.

No curculio has been observed, nor any evidence of the presence of yellows or other destructive diseases of trees.

I do not believe so large an area will be planted in trees this year as last, still trees have been contracted for by the thousand, and the amount planted will be considerable. I do not believe the area of table grapes will be increased, except possibly in the Santa Cruz Mountains.

I believe the culture of berries is increasing in area and importance.

REPORT OF A. F. WHITE,

Commissioner for the Sonoma District.

To the honorable State Board of Horticulture:

GENTLEMEN: It is the design of this report to give a very general description of some of the physical characteristics and horticultural capabilities of the extreme northwestern part of California. For fuller details reference is made to the "Reports of the County Boards of Horticultural Commissioners," found in the published annual reports of the State Board of Horticulture.

The Sonoma Horticultural District consists of the counties of Marin, Sonoma, Lake, Mendocino, Humboldt, Trinity, Del Norte, and Siskiyou—eight in number. The territory thus designated is a narrow, irregularly shaped belt of land, including nearly one half of the seacoast of the State, and extending from the bay of San Francisco northward about four hundred miles to the Oregon line. There are three inland counties—Lake, Trinity, and Siskiyou—the others all have landing places accessible for ocean steamers, and there are many intervening shipping points constantly visited by smaller vessels.

The eastern boundary of the district is the highest summit of the Coast Range of mountains, which attains its greatest elevation through its central and northern sections, and overlooks the valley of the Sacramento through its entire length. This valley terminates in a plateau with an altitude of from three thousand five hundred to four thousand five hundred feet, and includes all the northeastern part of the State, and extends far into Oregon.

Siskiyou County comprises three million eight hundred and ninety thousand acres of this plateau, and is distinguished for its deep gorges and cañons, for its impassable precipices, and for the roughness and extent of its "lava beds," which cover continuously thirty-four townships in its northeastern portion. The Coast Range and the Sierras unite about the line of its southern boundary, in the neighborhood of which are Lassen's Peak, the Black Buttes, Twin Sisters, and other mountains remarkable for their magnitude and height. From the midst of these, and surpassing them all in every attribute of physical greatness, is Mt. Shasta, a splendid old volcanic cone which rises fourteen thousand four hundred and forty-two feet above the level of the sea. To the westward the plateau is divided into a series of high ridges and of lofty mountains, which pass through many windings and breaks, but generally run parallel to the coast, and, taken together, constitute the Coast Range. Southward these mountains generally decrease in altitude and are less rugged. But at intervals through their whole extent mines of gold and silver, of cinnabar and copper, of lead and of iron, have been discovered and are worked with success.

The area of this district is estimated to be thirteen million nine hundred and fifty-seven thousand acres, a little more than twenty-one thousand eight hundred and seven square miles—an area much larger than the whole of Switzerland, larger than Greece, and almost as large as Holland and Belgium combined—and yet it is said that more than one half of it is too mountainous for cultivation. It abounds in small valleys of every conceivable shape. Some are nearly round, but most of them are long and narrow and irregular, conforming closely to the

contour of the hills with which they are surrounded, or to the windings of the streams along the margins of which they most frequently occur.

With the exception of the higher peaks and bare precipices, nature has spread over all this extent of territory a deep, rich soil, the product of the dissolution of rocks representing almost every geological age. Glaciers and earthquakes, fire and frost, tempests and whirlwinds, those irresistible disintegrating forces of nature, split, hewed, and ground even the hard granite to powder, while the milder but no less efficient chemical agencies reduced it to an impalpable pulp. When the process of assimilation was sufficiently complete the earth brought forth grass, herbs, and trees, and huge forms of animal life, and we trace out their fossilized remains as they lie scattered over the hills, attesting the circumstances of their growth and the facts of their existence. Radical changes occurred later on, but the vegetable mold of ages mingled kindly with the loams and clays, and warmed, fertilized, and adapted them to the wants of the different classes of plants of the present age.

It is, moreover, a well-watered country. Springs cold and hot, medicinal and pure, burst forth from its rocks and from the sides of its hills. There are multitudes of living streams, brooks, creeks, and rivers winding through the cañons and valleys. The Smith and Klamath, the Mad River, the Eel and Russian Rivers, are among the more important. Rhett Lake, Klamath Lake, and Clear Lake all afford pleasant navigation for small steamers, and villages along their shores are rapidly becoming places of enterprise and of public resort. The average annual rainfall varies from twenty-one inches in Marin County to seventy-four inches in Del Norte. The snows which accumulate in immense bodies on the sides of the high peaks and of the lofty ridges, are great reservoirs to be melted by August suns and brought down to supply the needs of the thirsty soil in the rainless season. Then, the winds from the ocean blow inland at the same time and are laden with moisture, which they distribute broadcast. With such never-failing resources there is no need of irrigation, and it is not practiced.

The seabreeze modifies the heat of summer and tempers the cold of winter. At an elevation of fifteen hundred feet above the level of the ocean the annual average temperature is from 52 to 60 degrees, indicative of a climate peculiarly favorable to the complete development of every variety of vegetable life not absolutely tropical nor Arctic.

Marin County includes the mountainous peninsula between San Pablo Bay and the Pacific Ocean. It has an area of three hundred and twenty-six thousand acres, and extends from the Golden Gate north to within a few miles of Bodega. It has a greater length of coast line than any other county in the State. Its hills rise abruptly and attain their greatest altitude two thousand six hundred feet above sea-level, in Mt. Tamalpais. There are many small and fertile valleys, sparsely covered with oak and laurel, and on the sides of the mountains and in the cañons there are clusters of madrones and of stunted pines. There is a grove of redwood trees covering five or six hundred acres on the shoulders of Mt. Tamalpais. Nearly all the deciduous fruits are grown in localities sufficiently protected from the winds of the ocean. About two thousand acres are now in vineyards in full bearing. It is claimed, however, that in the annual average yield of dairy products per cow, Marin excels that of any other county in California, and that it is scarcely equaled by any county in the United States. These pasture lands extend along the

coast farther north in long stretches four or five miles in width, with but little variation in value.

Adjoining this dairy belt on the east, and running from a point a little north of Bodega Bay, through the whole length of the district, is, in some respects, one of the most remarkable forests of timber in the world. It varies in width from ten to fifteen miles, but is very irregular; and along Eel River is from twenty-five to thirty miles in width. It is narrower farther north, and entirely disappears about the Oregon line. It is roughly estimated to cover an area of at least one million acres. There are many varieties of trees in this forest, among which are the pines, the firs, the cedars, and others, but those which are the most prominent and attract special attention are commonly known as "The Redwoods" (*Sequoia sempervirens*). In size and height they are second only to the "Big Trees of the Sierras" (*Sequoia gigantea*). It is not known that these trees grow elsewhere in any country. The *Gigantea* is found only in small groves, often remote from each other, and may be the remnants of the forests of some former geological age. They have fallen into destructive hands, and without special governmental care will soon pass away.

There are groves of considerable extent of the redwood (*sempervirens*) in Monterey, Santa Cruz, and San Mateo Counties, but they are disconnected and can hardly be called forests.

The great size and height of the redwood trees and their crowded position excite universal surprise. It is not uncommon for them to measure ten, twelve, and fifteen feet in diameter, and attain a height of two hundred or two hundred and fifty feet. There are places where they occupy for standing room fully two thirds of the ground. Generally their trunks are straight and symmetrical, and often without a knot or a limb for one hundred and fifty feet.

The great value of redwood lumber has long been known on the Pacific Coast, and is now acknowledged in the Eastern States, in England and France, and wherever it has been carried in commerce. Only more recently, however, has it become known that there is no wood which surpasses it for all ornamental purposes. The stumps and roots, generally regarded as worthless, are naturally most beautifully curled, and when properly polished meet the demands of the most refined tastes for absolute elegance.

The eastern border of this forest is lined with groves of pine, cedar, fir, and spruce, which rapidly multiply towards the north and east. Great bodies of this timber crown the summits and cover the sides of the higher peaks. In Trinity, Del Norte, and Siskiyou Counties they form into dense and extensive forests of great value.

"Lumbering and mining" have been and are yet to a considerable extent the principal resources of the people.

Most of the lower hills and valleys are sparsely covered with white, black, chestnut, and evergreen oaks, intermingled with madrona, laurel, mesquite, ash, buckeye, maple, black walnut, cottonwood, mountain mahogany, willow, alder, yew, mace, and other indigenous trees.

This part of California, so remote from the great thoroughfares of the country, and so rugged in its appearance, attracted but little attention in the early history of the State. The Russians made a small settlement at Fort Ross in 1811, and it is stated that they, in 1814, obtained from the Spanish Mission Dolores the first peach tree ever introduced

into this district. It was planted at the fort, and so protected and cultivated that it did not come into bearing until 1820. Two or three years later other peach trees were procured from Monterey, and in 1817 grapevines were imported from Lima, which fruited in 1823. In 1820 an importation of one hundred trees was made, consisting of apples, pears, peaches, cherries, plums, and prunes. They commenced bearing in 1828, and late writers claim that about thirty of these trees are still living, though all so gnarled and moss-grown as to be scarcely recognizable.

On April 4, 1824, the Spanish Mission of Sonoma was established, and in the fall following a small number of fruit trees and about three thousand grapevines were planted.

It was here that on June 14, 1846, thirty-three or thirty-four pioneers, under the leadership of Wm. B. Ide, captured the late General M. G. Vallejo and other officers of Governor Castro, raised "The Bear Flag," and made the first decisive declaration of independence from the government of Mexico.

At length in the progress of events the demand for lumber directed attention to the redwoods. Explorations were made and mills erected. The land was claimed under the laws of Congress; settlements were formed, and gradually farms productive of wheat, barley, oats, hay, and hops were cultivated. The potatoes of Humboldt and of Bodega became celebrated. Small herds of cattle prospered and dairies were made. A few sheep here and there grew into flocks numbered by the thousands.

Fruit-bearing trees of almost every variety were imported from Oregon, mostly as an experiment. They grew rapidly, and larger importations were made, until in a few years there was an over-supply of fruit for home consumption. The means of transportation were so unsatisfactory that but little effort was made to send the surplus abroad. Since, the attention to fruit growing has been regulated very much by the prospective building of railroads. The construction of the North Pacific through Sonoma County was immediately preceded by a general increased interest in every department of this industry. Large ranches were divided, and thousands of acres were planted in vineyards and orchards. Now this county ranks among the very first in the State in the quantity and excellence of its fruit products. The spirit of enterprise thus stimulated has spread over the district, and although the means of transportation are still very unsatisfactory in many places, there is an awakened interest in the study of every department of horticulture. Inquiry is abroad in regard to the character of soil and of climate best adapted to the highest development of certain varieties of the apple, of the peach, and of all deciduous fruits. Orchardists are increasingly careful in regard to the trees they plant, upon what stock they have been worked, and how they should be reset, cultivated, and pruned. They are also interested in the study of the appearance and habits of insect pests, of the different diseases to which fruit trees are exposed, and of their most efficient remedies.

Under this impetus many of the great grain fields in the valleys are rapidly giving place to orchards, and could a railroad be built through the central part of this district, establishing connection with the Oregon system of transportation, it would open a vast and fertile country to the horticulturist—a country peculiarly adapted to all kinds of fruit growing. This fact is clearly indicated in the great variety and excellent

quality of its indigenous fruits, among which are the strawberry, raspberry, thimbleberry, huckleberry, and blackberry. There are many varieties of wild grapes and of plums; there are cherries, crabapples, black walnuts, and chestnuts. It is a fact, also, that almost wherever the manzanita (little apple) is found some variety of the domesticated apple will grow.

All the domesticated fruits cultivated on the Pacific Coast succeed well in this district. Berries of every description grow vigorously and bear abundantly. There are fields of blackberries of five, ten, and fifteen acres of almost unequalled productiveness. This remark is true, also, of all the different varieties of plums and prunes, many hundreds of acres of which have been in full bearing for years, and the annual yield is a matter of surprise. Near the coast where the chilly winds of the ocean prevail the peach does not succeed, or succeeds indifferently in protected localities; inland, in genial soils, it attains its highest perfection. The apricot and nectarine are not cultivated extensively, but where tried do well. The pear grows with great vigor, produces large crops, and is highly esteemed for its excellent qualities for all purposes.

On damp and heavy soils, in low valleys, where from any cause the heat is great in midsummer, only exceptional varieties of the apple are a success, unless *effectually protected*. The Baldwin, Bellflower, Pearmains, and trees of similar habits, may grow well, but the fruit will often sunburn, lose its flavor and size, and be altogether inferior. There are exceptions to this statement in localities where there are protecting hills and other counteracting agencies. Experience proves that apples, first class in all respects, of almost every variety, are more surely grown on kindly soils, at an elevation of from one thousand five hundred feet to about four thousand feet, provided the trees are carefully shielded from severe north winds, and are not too near peaks covered with extensive snow-banks, which chill the air and produce fatal frosts. The superiority of size, flavor, and keeping qualities of apples thus grown is abundantly proved.

In many respects this district is the home of the cherry. With reasonable care and cultivation the trees are vigorous and healthy and produce largely every year.

The quince grows well and bears well. The same remark is applicable to the Siberian crabapple, to the Japanese persimmon, to the Italian chestnut, to the almond, and to the English and American walnuts.

Orange groves are in successful bearing in the neighborhood of Sonoma and in the Los Guillicos Valley. Isolated and small collections of trees are doing well in Santa Rosa, about Healdsburg and Cloverdale. The palms do well in the same localities.

The fig has been cultivated to about the same extent as the orange, perhaps as far north as the valley of Eel River. There is scarcely a doubt that the Mission and other hardy varieties will, with proper care, do well in protected places in any part of this district.

The olive is grown in large orchards near Sonoma, Santa Rosa, Healdsburg, and other places. Many varieties are being tried, and thus far all grow with remarkable vigor, and where old enough, the trees have produced large crops. The climate and soil of the foothills and of the lower ridges and mountains are peculiarly well adapted to the character and habits of this valuable tree. The oil produced for several years past has been pronounced of the very best quality, and has taken

prizes regularly at the various State and county fairs ever since it was placed upon the market. This promising industry should be greatly extended and will, at no remote day, become a permanent and successful source of revenue.

All varieties of the grape grow strongly everywhere, wherever there is soil sufficient to give the vines a foothold, and the moisture is not too great. Raisins cannot be cured well in the sun, owing to the general dampness of the atmosphere.

The insect pests and diseases common to the vines and fruit trees on the Pacific Coast are found to some extent in this district. It is earnestly hoped that their encroachments will be effectually resisted, and that they will eventually be utterly exterminated.

The physical characteristics of this district, briefly noticed in the early part of this discussion, establish the fact that its climate and soil are especially favorable to the production of vegetable life, or it could not have brought forth and sustained through unknown ages trees of such unrivaled magnitude, forests of such density and extent, with grasses, herbs, and flowers of such value and beauty.

Its horticultural capabilities are demonstrated, not only in the variety and excellence of its indigenous fruits, but in the vigorous growth and wonderful productiveness of all the domesticated kinds which have been tried. Encouraged by these facts, wherever there are practical facilities for transportation, individuals are renovating the older orchards and making new ones. Coöperative colonies have been formed, and are planting hundreds of acres with apples and other fruits. A company owning a vast extent of land has placed many thousands of acres in the neighborhood on the market, to be sold in small tracts, at from \$2 50 to \$7 50 per acre. All the principal may remain five or six years unpaid; the annual interest only is required. The purchaser signs an obligation to plant a given number of fruit trees every season, until a deed is obtained for the land. Under this arrangement one hundred and forty-seven thousand trees were planted one year ago, and one hundred and twenty thousand trees will be planted this season.

There is an inviting field and ample room for more than one hundred such companies in this district.

REPORT OF SOL. RUNYON,

Commissioner for the Sacramento District.

To the honorable State Board of Horticulture:

GENTLEMEN: I have the honor to herewith submit my report as Commissioner for the Sacramento District. This district comprises the counties of Sacramento, Yolo, Sutter, Tehama, Colusa, Butte, and Shasta, and, in most of these counties, the past season has been remarkably favorable. The output of fruit has been larger than usual, and prices, while not ruling so high as during the previous year, have been fair. Altogether, the fruit growers of this district have small cause for complaint.

One particularly favorable feature of our orchards, which I have observed in my journeys about the different counties under my care, is their increasing cleanliness and growing freedom from insect pests.

This has been brought about almost wholly through the efforts of the County Commissioners, who have been willingly seconded in their efforts by the individual fruit growers. The result of this united effort against pests and fungi diseases is visible in the whole district. The trees are particularly bright and clean, and, while we can scarcely hope to entirely eradicate the pests which cause us so much trouble, annoyance, and expense, we may at least hope, with continued union of action, to keep them below the injurious stage. In fighting pests, the remedies and means prescribed by the State Board of Horticulture have been generally availed of, and with most excellent results.

The fruit industry is *the* one great industry of this section, and that the care bestowed upon our orchards in keeping down the pests is profitable from a financial point of view, is amply proved by the fact of increased prices being obtained from the orchards which were properly sprayed and cared for.

One thing that has come to my attention is the steady decrease in the scale pest. This is noticeable over the whole of my district. In many orchards which were at one time badly infested, this pest has now almost wholly disappeared. Whether this is due to foreign agencies, or to persistent spraying, I am unable to say, but incline to the belief that it is largely due to continued efforts in fighting pests, and which are now showing good results in this as in other respects.

Butte County is rapidly assuming an important position as the orange center of the northern portion of the State, and the output of citrus fruit from this section in the past three years has proved what her capabilities are in this direction. An impetus to this branch of horticulture has been given by the citrus fairs which have been held at Sacramento, Oroville, Marysville, and Auburn, and at which the fact has been amply demonstrated that citrus fruits will grow, flourish, and prove a profitable crop in the central portion of the State. It is estimated that there are now planted, within fifteen miles of Oroville, 98,349 orange trees and 6,812 lemon trees, as shown by the following table:

PLACE.	Orange.	Lemon.
Half-mile of Court-house, Oroville	4,000	50
Vicinity of Oroville	20,816	1,581
Palermo	40,348	5,114
Thermalito	32,370	10
Wyandotte	815	57
Totals	98,349	6,812

As indicating the extent and profitableness of fruit growing in Butte County, I append the following statement from General Bidwell, of Chico:

"I am unable to furnish you with any data in regard to the fruit product or shipments from this county aside from that raised on my own ranch.

"During the season just passed I raised and gathered on Rancho Chico the following quantities of different varieties of fruit:

Blackberries	19,626 pounds.	Pears	113,178 pounds.
Cherries	145,201 pounds.	Almonds	148,044 pounds.
Apricots	285,815 pounds.	Nectarines	81,783 pounds.
Quinces	3,172 pounds.	Prunes	377,416 pounds.
Grapes	521,447 pounds.	Plums	461,542 pounds.
Apples	662,209 pounds.	Peaches	2,529,246 pounds.

"These were raised from about five hundred acres of bearing orchard. In addition thereto I have about seven hundred acres of young orchards not yet in bearing. Inasmuch as I sold my crop of fruit green to outside parties this year, I am unable to give you any statistics as to what proportion of it was dried and what proportion was shipped green."

Fruit growing in Colusa County really dates from 1884-85. A few trees had been planted prior to that time, as it happened, and, like Topsy, "they grewed;" but about this period a few of the more enterprising people in Colusa began to plant orchards, and success has attended all of them. Indicating the growth of horticulture in this county in this short period, I append the statement of the Assessor as to the number of trees now planted there:

	Bearing.	Non-Bearing.
Apricot	13,372	11,925
Cherry	721	976
Fig	1,202	2,692
Olive	69	435
Peach	20,385	17,584
Pear	28,913	16,940
Prune (French)	12,538	60,108
Prune (other kinds)	1,240	3,374
Lemon	4	54
Orange	95	765
Almond	2,807	1,214
Walnut	1,212	2,671
	82,558	118,718
		82,558
Total		201,276

Since these figures were taken, L. F. Moulton has set out an orchard of three thousand orange trees on the east side of the river, a short distance from Colusa, and at the present writing they are doing well and give great promise for the future.

It will be observed in the above list that, in point of numbers, prunes lead, with peaches second, pears and apricots coming next in nearly equal numbers. Of prunes, there are seventy-two thousand six hundred and forty-six trees, or about six hundred acres. Assuming that these trees have all been planted on good soil and produce only fairly, their dried product will reach nearly two hundred carloads annually when in full bearing.

I have made some estimate of the output of dried fruit from this county for the present season, and find the same to be about as follows:

Dried apricots	50 tons.
Dried peaches	30 tons.
Dried prunes	75 tons.
Dried nectarines	3 tons.
Dried pears	3 tons.
Almonds	7 tons.

Colusa orchards are young and just beginning to bear, but at the present ruling prices for dried fruit her fruit crop this season, including that sold for canning, will net her nearly \$30,000. For a beginner this is a good showing, and gives promise that before long Colusa will take her proper stand among the first fruit counties of California.

Tehama County is also making rapid strides in the direction of horticulture, as is shown by the Assessor's statistics, giving the number of fruit trees now bearing and of young trees lately planted, which have not yet come into bearing, in this county:

	Bearing.	Non-Bear- ing.
Apricot	21,707	16,414
Cherry	2,391	2,672
Fig	2,428	8,614
Olive	80	6,615
Peach	177,873	42,988
Pear	10,425	24,151
Prune (French)	16,086	85,048
Prune (other kinds)	2,844	5,228
Lemon	5	151
Orange	72	1,022
Almond	2,876	25,256
Walnut	205	1,264
	236,470	169,423
		236,470
Total		405,893

That these figures are rather under than over the amount is probable, owing to the inadequate means furnished the Assessors of the State to acquire statistical information. As the matter of gathering statistics is left largely optional with the Assessor, in many counties it is entirely neglected, and in most but carelessly performed. I would add, however, that I believe that the work in the counties in this district has been as faithfully performed as in any in the State, but there is always room for questioning the accuracy of Assessors' statistics. Where they err, however, it is never on the side of exaggeration; they are not given for boom effect, and so usually fall below the true numbers.

Cone & Kimball, of Red Bluff, place the output of dried fruit from Tehama for the past year at one hundred and twenty-five carloads. Added to this are large amounts shipped green and disposed of to canners, which indicate that Tehama, too, is an important factor in the fruit-producing region of the Sacramento Valley.

Sutter County has long borne an enviable reputation for the quality of her fruit and fertility of her soil. A great deal of attention is now being paid to the prune, which here does remarkably well, the trees attaining large growth and coming into bearing early. The industry is a comparatively new one, but during the past season one hundred tons of prunes were packed, of which amount R. C. Kells put up thirty-five tons, S. J. Stabler twenty-five, T. B. Hull ten, the Bunce orchard fifteen, Robinson Brothers five, and C. Weeman ten. The soil here seems especially well adapted to the prune, as in fact to all fruits, while the heat of the summer and the assured freedom from rain or atmospheric moisture of any kind during the curing season, is very largely in favor of the success of the fruit drier.

The Assessor's report for 1891 gives the following number of trees in Sutter County:

	Bearing.	Non-Bear- ing.
Apricot	21,584	11,984
Cherry	1,779	1,578
Fig	1,089	5,672
Olive	67	1,545
Peach	58,002	37,194
Pear	13,615	29,346
Prune (French)	8,139	8,581
Prune (other kinds)	10,299	2,094
Lemon	27	325
Orange	353	3,144
Almond	11,359	15,687
Walnut	515	334
	121,808	117,432
		121,808
Total		239,240

Sutter has shipped a very large quantity of fruit in the past season. Through the Fruit Union alone one hundred and sixteen cars of green fruit were shipped East; besides this a large amount was shipped by private individuals, a great deal more found its way to San Francisco jobbers, while the largest quantity was dried or canned. Prices have ruled very fair, many of the growers having contracted their orchards early in the season to jobbers at prices which the later market proved very good. It has been demonstrated here that one acre in fruit will equal in its net returns ten acres in grain, and it is this fact that has given so large an impetus to the fruit industry of Sutter County. It is a safe estimate that over two thousand acres are now planted to fruits and vines in the vicinity of Yuba City, all tributary to the canneries of that place and Marysville. It is this industry that has started the county seat on the road to growth and prosperity, and is the main factor in keeping up and increasing the population of Sutter County.

It has been demonstrated beyond peradventure that the citrus family will flourish here, and the orange crop this season is a full one. A very large pack of raisins, dried fruit, and nuts is reported, and on the whole horticulture in Sutter County is in a flourishing and healthy condition. Raisins also do well, as in fact does any class of fruit which receives proper care and intelligent cultivation.

Yolo has in the past year made gigantic strides in the horticultural field. Large bodies of land have been planted to trees in the season of 1891. The Yolo Orchard Company, composed of D. M. Burns, E. J. DePue, C. H. Waterhouse, Sam Jones, A. T. Hatch, Frank McMullen, and C. S. Givens, was organized in the latter part of 1890 for the purpose of setting out four hundred acres in fruit near Woodland, and it is estimated that nearly one thousand acres of new land have been put to fruit in the Capay Valley. These facts are sufficient to prove the faith which those who know her best have in Yolo as a fruit section. The apricot here does especially well, and has proved a very remunerative crop in the past. But the most valuable crop, from the experience of the few engaged in the business, has proved to be the prune. The French prune grafted on the Myrobalan stock has netted as high, in some

instances, as \$500 and \$600 per acre, and a ten-acre prune orchard, when in full bearing, would not only make a good living for an industrious man, but would enable him to enlarge his bank account from year to year and even enjoy the luxuries of life. A great many acres will be planted to prunes, and many more would be planted if the young trees could be had. Oranges are proving a success, but there are but few trees so far in full bearing. Raisins do well, and the crop of the past year has been very large.

The fruit crop of Shasta County for the season of 1891 was much more than an average, there being a great deal more of all varieties raised in the county than during the previous year, and with the exception of apples, which were affected this year with moth, etc., the fruit was of the best quality.

Canneries and drying establishments have been established, and a great deal of canned and dried fruit was shipped from the county. Raisins were also shipped from the county by the carload. Oranges were raised in different parts of the county, but only enough for home consumption.

The reputation of Sacramento is national, and little need be added here; suffice it to say, that the fruit crop of the past season has not in the least lessened that reputation. For fully thirty miles along the east bank of the Sacramento River will be found a continuous growth of bearing trees and vines, which produce all kinds and varieties of fruit. That portion of the county is the principal source of supply required to meet the heavy demands from the East for her products. For excellence of flavor and keeping quality the Bartlett pears and peaches claim especial merit, for the invariable record of higher prices and better demand in all Eastern markets is invariably demonstrated in favor of those lines, as well as for other Sacramento County products. The daily output from the Sacramento River section necessitates the employment of five large steamers to move the product required to supply the shipping, canning, and drying trade. The view along the river is beautiful in the extreme, for the magnificent orchards, adorned with numerous palatial mansions, present a scene most suggestive of prosperity and comfort, which is strongly indicative of the beneficial results that are obtained from the influences surrounding the life of the energetic California farmer.

On the banks of the American River are many magnificent orchards and vineyards; one in particular, that of the Natoma Company, which is the second largest vineyard in the world, there being over three thousand acres in actual bearing. The annual production of wine from this vineyard is over five hundred thousand gallons.

The following table shows the importance of Sacramento as a center of the fruit business. Total shipments from January 1 to December 10, 1891:

Green fruits.....	55,201,231 pounds.
Dried fruits.....	13,803,640 pounds.
Canned goods.....	79,755,580 pounds.
Raisins.....	43,680,000 pounds.
Hops.....	4,066,370 pounds.
Wine.....	11,566,920 pounds.

In comparison with other counties the record of the shipments made through Sacramento City, the distributing point of the county, shows

that Sacramento County prominently leads in the heaviest production and shipment of green fruit, hops, and vegetables, over all counties of the State, the second heaviest in shipments of dried fruit and wine, and third in the proportion of canned goods.

A large amount of the fruit output of Sacramento was carried on the river boats, of which the "Thomas H. Dwyer" reports having carried two thousand and fifty tons of green fruit, and the master of the steamer "Apache" states that his fruit shipments from points on the Sacramento River during June, July, and August, 1890, amounted to two thousand six hundred and five tons. During the same period of 1891 they amounted to four thousand four hundred and sixty tons, an increase of one thousand eight hundred and fifty-five tons for the season.

The California Transportation Company furnishes the following statement of fruit, in tons, carried on their boats from Sacramento River points during the same period:

	1890.	1891.
Apples.....	373	663
Apricots.....	1,034	1,220
Berries.....	6	11
Cherries.....	12	32
Dried fruits.....	28	57
Figs.....	51	48
Grapes.....	580	573
Melons.....	3,078	2,120
Melons, nutmeg.....	137	180
Peaches.....	2,875	5,306
Pears.....	1,998	4,048
Plums.....	195	469
Prunes.....	41	117
Quinces.....	33	41
Tomatoes.....	961	1,100
Fruit to canneries.....	442	1,446
Totals.....	11,844	17,431

This table shows an increase of five thousand five hundred and eighty-seven tons over the amount carried in 1890, indicating clearly the increased production of the sections tapped by their steamers.

SUPPLEMENTARY

REPORT OF B. M. LELONG,

Secretary State Board of Horticulture, and Ex officio
Chief Horticultural Officer.

PART I.

THE FRUIT SEASON OF 1891.

REPORT OF B. M. LELONG,

Secretary, and Ex officio Chief Horticultural Officer.

CHAPTER I.

REVIEW OF THE FRUIT SEASON.

DEMAND AND PRICES.

The fruit season of 1891 has not been so profitable as was that of 1890. A fair average yield is reported from the various fruit sections of the State, but prices have been very much depressed and the demand light. This condition, immediately succeeding, as it did, the remarkably profitable season of 1890, seems the duller by contrast. Still, fair prices have ruled, and, while not doing so well as in the previous year, the fruit growers of California generally report having done fairly well.

Several causes have combined to depress prices. Last year there was keen competition among jobbers. Large stocks of fruits and raisins were purchased for a future demand, and when the demand came it was much lighter than had been anticipated by the jobbers, who lost heavily. Profiting by their experience last year they have gone to an extreme of caution in their purchases this season, and are handling very small stocks—only such quantities that they see an almost immediate demand for. No heavy stocks are being carried, and the fruit is largely left in the producers' hands.

A second cause for this depression is found in the unprecedentedly large fruit crop in the Eastern States. Last year's crop was almost a failure, and it was upon this fact that the jobbers speculated so heavily. This year the Eastern yield has been very large, resulting in a natural lessening of cost and an increased consumption. People on farms and in towns, who last year purchased California canned and dried fruits, have this year packed their own, and fruit preserving has been resorted to by millions of people there, thus shortening the demand for the California product. The Eastern trade journals report the demand for glass fruit jars so large that all the glass factories in the country have been unable to meet it. This has had its effect upon the jobbers in buying California fruit. They recognize the fact that the home product must be exhausted before there will be a large demand for the imported article.

That this depressed condition will continue is very improbable, but seasons of depression, brought about by extraneous causes, may be looked for in the fruit as in all other industries, and no human foresight or ingenuity can guard against them. Our fruit growers should not feel discouraged on this account, for, even with the depressed condition of the market, orchards which were properly attended to and the output of which was intelligently handled have paid.

In the years 1889 and 1890 there were imported into the United States foreign fruits, as follows:

ARTICLE.	1889.		1890.	
	Quantities— Pounds.	Value.	Quantities— Pounds.	Value.
Figs	9,101,300	\$395,833	9,678,315	\$710,924
Lemons		3,000,867		3,797,069
Oranges		1,974,861		2,069,061
Plums and prunes	48,717,353	1,235,391	61,905,782	2,819,420
Raisins	35,972,017	1,826,232	44,798,769	2,315,557
Preserved fruits		881,309		1,381,111
All other fruits		1,368,257		1,393,695
Almonds	5,454,489	712,187	7,497,193	989,966
All other nuts		649,521		1,340,094
Totals		\$12,044,458		\$16,816,897

These figures clearly indicate that there is a large and increasing home market for California fruits yet unfilled, and are encouraging, in view of the fear of overproduction which has possessed some of our fruit growers, owing to the low prices and comparatively small demand of the present season.

Despite the heavy demand for California fruits in 1890, there was an increased importation of foreign fruits into the United States of \$4,772,439 over the preceding year, and a total of \$16,816,897 was paid out in that year for foreign fruits, the greater part of which California should supply.

A review of the rapidly increasing demand for fruits in the past should permanently set at rest all fear of overproduction in the future. The home market of the United States cannot possibly be filled by California for years to come, and when, if ever, it is, there are still chances in the European and other markets of the world for our supplies.

Thirty years ago there were imported into the United States 300,000 boxes of citrus fruits. In 1889 Florida contributed, to supply the demand, 600,000 boxes, and California contributed 780,000 boxes. Thus the country into which thirty years ago were imported 300,000 boxes of citrus fruit, produced within its own borders 1,380,000 boxes. What were the facts as to importation in the same year? From the report of the Senate Finance Committee, compiled for the use of the Senate of the United States in the discussion of the McKinley bill, and gathered from the most authentic sources, to wit: the Custom-house returns of the United States, it is shown and declared that in 1889 there were imported into the United States of citrus fruits 3,354,963 boxes and 113,927 barrels. Thus, notwithstanding the contribution of Florida and California to the volume of supply, the importation of citrus fruits into the United States was more than eleven times that noted prior to the beginning of home production. The entire demand of the United States thirty years ago was imported. When this country becomes a producer to the extent of 1,380,000 boxes, the importation in the same time has arisen to nearly 4,000,000 boxes, thus constantly widening the margin in favor of the home producer and forever silencing all prophecies of overproduction. In 1880 we shipped 590,000 pounds of dried fruit, and the shipments of 1889 reach over 33,000,000 pounds, or sixty-five times the volume of the shipment of 1880. Thus we supplied to the markets of the East in 1889 sixty-five times the annual volume supplied nine years previous. Of

green fruit, the amount of shipments in 1880 was 5,180,000 pounds, and this had increased in 1889 to over 50,000,000 pounds, or ten times the amount shipped nine years before. Of citrus fruits, in 1882 we shipped 917,000 pounds, and in 1889, seven years later, the amount had increased to fully 20,000,000 pounds. In 1880 the shipment of raisins was less than 800,000 pounds, and in 1889 it had reached 18,000,000 pounds.

The rapid increase of population in the United States promises a steadily increasing demand for our fruit products, for fruit is not now, as it was in the earlier part of the century, an article of luxury—it has become a food necessity. Improved methods of preserving fruit, in canning, drying, and other ways, have enabled people of the present age to have this desirable article of diet fresh the year round, and to add to their tables each day as staple food an article which their ancestors knew only in its season as a luxury. The result of this has been that fruit is gradually but surely replacing flour and meat, and, as there is more of the former used per capita, there is less of the latter. We are becoming a fruit-eating nation. This has been largely aided, too, by cheap transportation, brought about by the building of railroads to every corner of the land, and making it possible to remove our fruits at reasonable prices to those sections where they cannot be produced.

Aside from the home market there is a large foreign demand for our fruits, and canned goods are shipped to various parts of the world from California. A few years since California imported nearly all her canned goods from the East, but now she supplies the markets of the Eastern States, Australia, and Europe with their fruits, the superiority and cheapness of the California article having forced it to the front in competition with all others.

The quantity of canned fruit shipped by rail from California, from 1872 to 1890, is as follows:

1872	182,000 pounds.	1882.....	25,163,190 pounds.
1873	678,580 pounds.	1883.....	26,897,700 pounds.
1874	457,290 pounds.	1884.....	21,695,740 pounds.
1875	759,040 pounds.	1885.....	28,949,380 pounds.
1876.....	1,529,910 pounds.	1886.....	30,636,710 pounds.
1877.....	1,731,530 pounds.	1887.....	56,009,130 pounds.
1878.....	1,700,930 pounds.	1888.....	39,281,340 pounds.
1879.....	3,111,680 pounds.	1889.....	37,083,725 pounds.
1880.....	6,707,650 pounds.	1890.....	41,992,640 pounds.
1881.....	18,768,200 pounds.		

The enormous quantity of fresh fruit consumed by the canners of this State shows the relative position of the canned goods industry in connection with fruit growing in California. The total amount of fresh fruit used by our canners during the season of 1888 was 3,500 carloads, or 70,000,000 pounds, and the pack of fruit and vegetables for that year was as follows:

	Cases.
Table fruits (2½-pound tins)	1,223,165
Table fruits (gallons)	13,145
Pie fruits (2½-pound tins)	31,580
Pie fruits (gallons)	46,840
Jams and jellies	31,270
Vegetables (including tomatoes)	181,000
Total pack (24 cans to the case)	1,527,000

The leading fruits for canning are apricots, peaches, and pears. There were canned in 1885: Apricots, 10,000; peaches, 70,000, and pears,

80,000 cases. This quantity was increased in 1886: Apricots, 210,000; peaches, 130,000, and pears, 110,000 cases. There was an increase therefore of 290,000 cases altogether in these fruits in 1886 over 1885. In 1888 the pack reached for apricots, 328,456; peaches, 363,476; pears, 161,863, and plums, 121,838 cases.

In view of these facts the fruit grower need have little dread of over-production. It is true that California is not the only fruit-producing State of the Union, but it is generally conceded to be the leading one. A greater variety of fruits are produced here at less cost for cultivation and attention than in the Eastern States; the yield is more certain and usually much larger, and our orchardists can rely upon larger returns for their outlay and labor. There are many varieties of fruit, too, which do well and pay handsomely in California which cannot be produced in most of the Eastern States, as the citrus and sub-tropical varieties. The climate of California is particularly favorable to the fruit industry, and the soil in most portions of the State possesses, in a large measure, all the qualities required by the growing plant and the matured tree. These are facts which give assurance to the future of the fruit industry as a permanent and profitable pursuit.

Another advantage which the California orchardist has over his brother in the East is the comparative freedom of our trees from insect pests and injurious diseases. It is true that our State is not wholly free from these, but it has never known them in their worst forms. The destructive curculio has never been found here; the black-knot and the yellows, which have wrought such havoc in large fruit areas of the East, have never yet been heard of in this State. The vigorous system of quarantining against the introduction of pests and diseases introduced and prosecuted by this Board, and in which it has been so ably aided by the various County Boards throughout the State, has so far secured to our orchardists immunity from their most destructive enemies, and gives them an almost absolute guarantee of protection in the future.

As indicating the rapid growth, great importance, and vast possibilities of the fruit industry of California, General N. P. Chipman presents the following tabulated statement of the exports of fruit for 1890 in comparison with the export of wheat for the same year.

Shipped by the Southern Pacific Company to December 31, 1890.

PLACE.	Dried Fruit —Pounds.	Deciduous Fruit— Pounds.	Citrus Fruit —Pounds.	Raisins— Pounds.	Canned Goods— Pounds.	Nuts— Pounds.
San Francisco....	4,768,630	75,520	144,500	897,620	45,630,140	181,320
Oakland	856,020	1,871,930	-----	20,050	316,240	-----
Sacramento	8,275,920	46,865,220	-----	3,797,290	10,276,640	103,170
San José	13,962,210	12,185,020	-----	185,440	16,654,780	30,170
Stockton	8,534,350	5,040,634	-----	20,148,590	1,112,560	20,880
Marysville	2,181,770	982,510	20,850	546,340	3,422,660	21,140
Los Angeles	2,256,050	1,053,290	7,477,120	429,240	601,960	1,201,430
Colton	2,596,960	-----	10,801,850	1,345,860	2,106,970	16,290
Totals.....	43,377,910	68,084,124	18,444,320	27,370,430	80,121,950	1,574,400

Total by Southern Pacific Company:

Deciduous, pounds	220,528,814	Citrus, pounds	18,444,320
Deciduous, tons	110,264	Citrus, tons.....	9,222
Deciduous, carloads	11,026	Citrus, carloads	922

Shipped by the Santa Fe System to December 31, 1890.

PLACE.	Oranges— Pounds.	Dried Fruit— Pounds.	Raisins—Pounds.
All places	49,975,000	.....	.....
Los Angeles County .....	.....	10,036,360	250,000
Orange County .....	.....	2,400,000	25,000
San Bernardino County .....	.....	8,290,000	11,275,000
San Diego County .....	.....	490,911	2,200,000
Totals	49,975,000	21,217,271	13,750,000

Total by Santa Fe system :

Deciduous, pounds	84,967,271	Citrus, pounds	49,975,000
Deciduous, tons	17,483	Citrus, tons	24,987
Deciduous, carloads	1,748	Citrus, carloads	2,498

Summary.

Total carloads, all kinds, Southern Pacific Company	11,948
Total carloads, all kinds, Santa Fe system	4,246
Total pounds, all kinds, by both systems	323,915,455
Total carloads by both systems	16,194
Total cars for each day of the year	44
Total carloads shipped in 1880	546
Excess in 1890 over 1880	15,648

The total carloads of both systems during the year 1890 would make a solid train of cars one hundred and twenty-three miles long.

It is a significant fact that, while our wheat output has not materially increased from 1880 to 1890, our fruit output has increased more than thirty times, and is growing with great rapidity. While the showing here made still keeps California in the front rank of wheat-growing States, being third in rank, it demonstrates the great advantages of the State as a fruit-producing country. In 1880 our exports of fruit brought us, probably, about \$700,000, while they now amount to about \$20,000,000. This wonderful result has brought with it what is above all computation, to wit: the demonstration that fruit growing in this State is very profitable, and is almost absolutely safe from frosts and other drawbacks, and has practically no limit. Ten years have taught us, also, that we may resort to lands for fruit growing, and quadruple our present output, and still retain our primacy as a wheat and barley and wool-producing State.

Another promising sign is the gradual decreased importation of many foreign fruits into the United States, and the increased output of the domestic product. Illustrating this is the fact that the importation of foreign raisins, which in 1887 amounted to 40,673,288 pounds, valued at \$2,281,981, had decreased in 1890 to 36,914,330 pounds, valued at \$1,997,103, while the crop of California raisins increased, during the same period, from 16,000,000 pounds to 30,000,000 pounds.

The favor with which California fruits are received in the East, and their growing popularity, are proved by the numerous complimentary allusions in the press to our fruit products in both their green and preserved state. The New York "Tribune," under the caption of "A Wonderland of Fair Fruits," pays a glowing tribute to this great California industry in the following language:

When California first joined Uncle Sam's army of States, bringing a dower of gold and adding another atmosphere to her domain, it was little suspected how vast a reservoir of table needs and luxuries was concealed in her prolific soil. Wines and other

articles, once only to be seen in foreign invoices, have now a quoted commercial place as a domestic produce. The raisins of Spain now have a wholesale companion pouring in from the Pacific Coast, while the rich prunes of France must soon give way to a portion of her reputation, which she has held in the lead for centuries, since the introduction of our own from the golden shores. Heavy losses attended a host of experiments and ventures, but intelligent enthusiasm, supported by a generous outlay of capital, has prosperously rewarded the efforts of daring enterprise.

It also says:

California has the largest raisin-packing establishment in the world, and her prunes are seeking a wholesale place. The fancy grocers and confectioners are becoming less dependent on the glaze fruits of Europe. They were formerly an expensive article in an afternoon's tea-spread, and within the reach of comparatively few buyers. California houses are boxing delicious home-grown material with a delicate taste, fine color, and a showiness of style that is turning attention to the American fruits, especially as the prices at retail are 25 per cent less than those for foreign grades. California grapes have an indisputable hold upon the favor of consumers. Some of the leading winemakers abroad have predicted that California, in the near future, can supply the red wine of the world.

The export of fruit from the shipping centers of the State, for the year 1891, over the Southern Pacific system, is given in the following table:

SHIPPING POINT.	Deciduous Fruit—Pounds.	Dried Fruit—Pounds.	Citrus Fruit—Pounds.	Raisins—Pounds.
San Francisco.....	118,000	6,476,000	68,000	1,052,000
Sacramento.....	55,542,000	14,334,000	10,000	4,402,000
San José.....	12,452,000	24,370,000	-----	192,000
Los Angeles.....	1,556,000	856,000	15,932,000	826,000
Stockton.....	5,630,000	5,284,000	-----	29,398,000
Marysville.....	2,138,000	4,616,000	20,000	396,000
Colton.....	-----	1,022,000	14,976,000	1,046,000
Oakland.....	1,388,000	588,000	-----	44,000
Totals.....	78,824,000	57,546,000	31,006,000	37,356,000

This table shows an increase for 1891 over those of 1890 of 11,695,-440 pounds in deciduous fruits, 5,771,020 in dried fruits, 12,561,680 in citrus fruits, and 11,708,380 in raisins.

The overland shipments of canned goods, via the Southern Pacific Railroad, for the first nine months of the year, were as follows, in pounds: From San Francisco, 14,364,570; Oakland, 1,011,870; Sacramento, 4,886,630; San José, 7,070,770; Stockton, 1,043,070; Marysville, 1,441,440; Los Angeles, 493,520; Colton, 376,140; total, 30,688,010. Fully 90 per cent of the above was canned fruit, the remainder being canned vegetables.

The total overland shipments, via the Southern Pacific Railroad, of fresh, dried, and canned fruits, aggregate, in round numbers, 74,000 tons for the first nine months of the year.

The Southern California Railway Company shipped over its lines, for the year 1891, fruit as follows:

	Pounds.
Oranges.....	57,435,000
Lemons.....	378,000
Raisins.....	10,874,000
Dried fruits.....	11,544,000
Other fruits and vegetables.....	41,360,000
Total.....	121,091,000

East-bound shipments of fruit from Los Angeles, via the Southern Pacific, for the year 1891, are reported as follows:

	Pounds.
Citrus fruits	36,623,290
Dried fruits	1,841,860
Deciduous fruit, green	1,637,460
Raisins	2,029,070
Canned goods	1,550,670
Nuts	1,010,310
Total	44,692,660

Besides fruit moved from the interior counties by the Southern Pacific Company, large quantities found their way to San Francisco by steamboats from points on the Sacramento River. Of these amounts, the "Thomas H. Dwyer" reports having carried 2,050 tons of green fruit, and the master of the steamer "Apache" states that his fruit shipments from points on the Sacramento River, during June, July, and August, 1890, amounted to 2,605 tons. During the same period of 1891, they amounted to 4,460 tons, an increase of 1,855 tons for the season.

The California Transportation Company furnishes the following statement of fruit, in tons, carried on their boats from Sacramento River points during the same period:

KIND.	1890.	1891.
Apples	373	663
Apricots	1,034	1,220
Berries	6	11
Cherries	12	32
Dried fruit	28	57
Figs	51	48
Grapes	580	573
Melons	3,078	2,120
Melons, nutmeg	137	180
Peaches	2,875	5,306
Pears	1,998	4,048
Plums	195	469
Prunes	41	117
Quinces	33	41
Tomatoes	961	1,100
Fruit to canneries	442	1,446
Totals	11,844	17,431

This table also shows an increase of 5,587 tons over the amount carried in 1890, indicating clearly the increased production of the sections tapped by these steamers.

The Oregon Development Company shipped by steamer from San Francisco during the year 1891, fruit as follows:

SHIPPED TO—	Dried Fruit— Pounds.	Deciduous Fruit— Pounds.	Citrus Fruit— Pounds.	Raisins— Pounds.	Canned Goods— Pounds.	Nuts— Pounds.
Albany	3,400	10,535	38,680	3,030	21,185	7,710
Corvallis	815	16,138	22,402	1,185	5,735	3,450
Yaquima	3,055	29,320	12,101	1,025	8,870	2,035
Other points	9,830	5,265	17,114	5,315	24,215	7,751
Totals	17,100	61,258	90,297	10,555	60,005	20,946

Imports of fruit by the same company consisted principally of apples from Oregon, of which 70,334 pounds were brought to San Francisco by them during the year.

There were received in San Francisco from various points on the North Pacific Coast Railroad 1,431,730 pounds of deciduous fruits during the year 1891, all of which were consigned to jobbers in this city.

IMPORTS BY SEA.

The following table shows the importation of foreign fruits and nuts, as reported by the San Francisco Custom-house, for the year 1891:

MONTH.	Lemons—Value.	Oranges—Value.	Preserved Fruits—Value.	All other Fruits—Value.
January	\$695 00	\$3,724 00	\$2,576 00	\$2,401 00
February	695 00	476 00	1,604 00	2,405 00
March		276 00	2,035 00	2,687 00
April		89 00	1,493 00	5,736 00
May		2,542 00	2,142 00	7,484 00
June	887 00		2,240 00	7,902 00
July	97 00		708 00	5,210 00
August	93 00	11 00	4,542 00	4,507 00
September			3,360 00	3,725 00
October		1,192 00	8,771 00	7,868 00
November	10 00	4,322 00	6,546 00	2,989 00
December		2,811 00	2,911 00	3,201 00
Totals	\$2,427 00	\$15,898 00	\$38,928 00	\$55,615 00

MONTH.	Almonds.		All other Nuts—Value.
	Pounds.	Value.	
January	1,904	\$143 00	\$2,469 00
February	747	56 00	1,596 00
March	2,438	369 00	3,105 00
April	2,818	561 00	448 00
May	1,209	105 00	151 00
June	3,724	498 00	207 00
July	3,057	586 00	68 00
August	1,160	139 00	344 00
September	4,698	1,071 00	640 00
October	340	27 00	17,527 00
November	4,091	630 00	807 00
December	2,697	416 00	8,602 00
Totals	28,883	\$4,601 00	\$35,964 00

In July there were imported 2,016 pounds of prunes, valued at \$81; in September, 550 pounds, valued at \$69; in December, 1,320 pounds, valued at \$155, and in October, 2,352 pounds of raisins, valued at \$158; making a total value of all fruits and nuts imported by sea to San Francisco for the ten months named of \$119,986. Of the amount \$55,615 expended for unclassified fruits, the greater portion was for Mexican limes.

EXPORTS BY SEA.

The following table shows the exports by sea of fruit and nuts from San Francisco for the year 1891, from the Custom-house returns:

MONTH.	Apples.		Canned Fruit —Value.	All other Fruits, Green, Ripe, and Dried— Value.	Nuts—Value.
	Barrels.	Value.			
January	812	\$2,099 00	\$12,918 00	\$662 00	\$902 00
February	434	1,251 00	22,823 00	322 00	546 00
March	93	240 00	18,842 00	544 00	334 00
April	18	75 00	76,037 00	608 00	520 00
May			11,090 00	2,298 00	642 00
June			10,569 00	2,231 00	337 00
July	224	617 00	22,945 00	1,720 00	525 00
August	1,611	4,572 00	116,691 00	2,233 00	716 00
September	3,869	11,114 00	372,052 00	1,411 00	380 00
October	5,063	13,617 00	190,721 00	2,020 00	1,028 00
November	2,989	7,609 00	152,980 00	1,239 00	1,492 00
December	1,074	2,530 00	46,864 00	848 00	1,237 00
Totals	16,187	\$43,724 00	\$1,054,032 00	\$16,156 00	\$8,659 00

The California Fruit Union, which controls a large part of the output of deciduous fruits of the State, reports its shipments for 1891 at 1,387 carloads, a slight increase over the shipments of the preceding year, and a very encouraging increase upon 1888 and 1889. The following table gives the number of carloads contributed by various points for the past four years:

	1891.	1890.	1889.	1888.
Vacaville	278	254	171	163
Loomis	22	6		
Newcastle	83	138	38	38
San Francisco		2		
San José	304	290	206	97
Winters	102	109	28	25
Sacramento	294	196	278	346
Santa Barbara	5	2		
Marysville		3		6
Mullen's Switch		3		
Chico	3	1		
Shellville		1	18	
Suisun	65	68	47	11
Fresno	2	2		15
Davisville	12	26	22	24
Martinez	1	10	9	
Fowler	6	9		
Tulare	22	25		
San Lorenzo	30	28	58	33
Florin	50	59	32	
Colfax		4	4	12
Malaga		3		
Natoma	25	56	52	29
Elk Grove		1	5	
Bakersfield		24		
Sonoma	17	25		
Wrights	13	11		10
Haywards	8	1		
Cordelia		5		11
Manlove's Switch		10		
Pleasanton	1	1		
Blacks			1	
Napa			5	
Penryn			4	7
Mayhews			11	17
Santa Rosa				6
Woodland				2
Carried forward	1,343	1,373	989	848

	1891.	1890.	1889.	1888.
Brought forward	1,348	1,373	989	848
Concord	17	-----	-----	-----
Hueneme	14	-----	-----	-----
Armona	3	-----	-----	-----
Biggs	2	-----	-----	-----
Hanford	2	-----	-----	-----
Yuba City	2	-----	-----	-----
Buhach	2	-----	-----	-----
Lodi	1	-----	-----	-----
Soquel	1	-----	-----	-----
Total number of carloads for season	1,387	1,373	989	848

Of this year's shipment Chicago received 654 carloads; New York, 258; Minneapolis, 111; Omaha, 94; St. Paul, 54; Boston, 87; New Orleans, 55; St. Louis, 44; Kansas City, 20; Louisville, 9, and Buffalo, 1.

The cherry shipments were much larger than in any previous year, and the results were generally very satisfactory. The shipment of Bartlett pears was very heavy, and they generally arrived in good condition, but prices ruled very low and unsatisfactory on account of meeting with competition from Eastern Bartletts. The shipment of peaches was not very large and prices generally low, owing to the large crop of peaches raised in the East, and also to the fact of their crop being early, while ours was correspondingly late. The grape shipment was heavy, and compared fairly with other years in prices realized.

The first car shipped left Vacaville May 13th, the last car from San José December 3d, making a season of six months and nineteen days from first to last.

CHAPTER II.

CONDITION OF FRUIT IN CALIFORNIA.

CITRUS FRUITS.

The citrus crop of the State for 1890-91 was much in excess of that of any preceding season, but the demand for the fruit in the East did not appear to lessen on this account, and good prices were received by the growers. A glut of some of the earlier Navel oranges was reported from Riverside, due to inability to handle the large output of fruit rather than to any lack of demand for it. Interest in this branch of horticulture has not waned in the least, but seems to move with increased velocity, and, especially in the southern counties, vast areas of new land are continually being planted to citrus fruits. The great profits of this industry have attracted the attention of Eastern and local capitalists, and companies for the culture of citrus fruits on a large scale have been organized, and other companies, having in view the husbandry of water and reclamation of arid lands for citrus culture, have also been formed, all of which gives promise of a vast increase in citrus culture during the next few years. Outside of the southern counties attention is being directed to orange and lemon culture, and in many cases with remarkably good results. Good reports are made from Butte, Yuba, Placer, and other counties where citrus culture is attaining a strong hold.

The cultivation of the lemon seems to be growing in favor, and more attention to this fruit is now being paid than ever before. There are many portions of the State especially adapted to its culture, and it has been found a very profitable fruit. The difficulty heretofore experienced in handling and shipping has been overcome, through the publication by this Board of the method of G. W. Garcelon, of Riverside, who has met with such great success in this branch of the citrus industry.

The following table will show the importance of citrus culture in this State, and also indicates its rapid growth. The figures given are for the southern counties, where the great bulk of the fruit is produced. It is estimated that ten carloads will cover all that is exported as yet from other counties:

Shipments of Citrus Fruits.

COUNTIES.	1890.		1891.	
	Boxes.	Cars.	Boxes.	Cars.
Los Angeles	198,695	781	632,071	2,212
San Bernardino	487,000	1,705	487,882	1,708
Orange	112,190	307	147,332	516
Ventura	9,460	33	19,475	68
San Diego	6,600	23	18,861	66
Santa Barbara			6,478	23
Totals	813,945	2,849	1,312,099	4,583

This table includes shipments of both oranges and lemons; of the latter fruit there were 20,904 boxes shipped, which would make a total of 702 carloads.

The work done by the *Vedalia cardinalis* in this State cannot be better illustrated than by the reported shipments of citrus fruits from Los Angeles before and after its introduction. For years Los Angeles was the leading shipper of citrus fruits, but the introduction and spread of the cottony cushion scale so affected the industry that it was on the verge of extinction. In 1890 San Bernardino County, into which the cottony cushion scale had not forced its way, shipped 1,705 carloads of oranges, and Los Angeles 781 carloads. The *Vedalia* was at work, however, and the returns of 1891 were 2,212 carloads for Los Angeles and 1,708 for San Bernardino, an increase of three carloads for the latter county, while Los Angeles sprung in one season from 781 to 2,212, an increase of 1,431 carloads. The increase of San Bernardino was a natural one, but that of Los Angeles was due to other causes than the coming in of new orchards.

The season of 1891-92 opened very auspiciously for the orange growers. The trees were particularly thrifty, the fruit set in large quantities, and the indications promised a very large yield. On December 10-11, however, a severe wind visited a large portion of the citrus section, sweeping through the San Gabriel Valley, reaching Pomona, Ontario, Riverside, and other portions of Los Angeles and San Bernardino Counties, and doing a vast amount of damage. At Pasadena and San Gabriel, where the wind was especially severe, it was estimated that one third of the fruit was blown from the trees, and a large part of the remainder was injured to a greater or less degree. Following this, on the night of December 25th, was one of the severest frosts ever known in the Riverside section, where for over ten hours the temperature was below the freezing point, the mercury ranging from 21 to 28 degrees above. What the exact amount of damage is it is impossible to tell until the returns from the crop are in, but experts figure it at from one third to one half.

THE APPLE.

It has come to be accepted as a fact that in the lower lands of the interior valleys the apple is not a profitable crop. In some localities especially adapted to its growth, along the river bottoms, or on cold, damp land, some varieties will yield good results, but the fruit grown here is not usually fine flavored, or possessed of good keeping qualities. While this is true of this portion of the State, there is a vast area of territory upon which the apple does phenomenally well. In many of the coast counties, where the temperature is not too high, in the foothills of the Sierra and the Coast Range, and in the higher mountain counties, the apple is the standard fruit crop, and the fruit produced here surpasses in size and quality that of the apple sections of the East. To those who have good apple lands adjacent to means of transportation to the centers of demand, the apple has proved a remarkably profitable crop.

The fact that the apple was first planted in the valley lands where soil, climate, seasons, and other conditions were so different from its natural requirements, caused it to yield indifferent returns, and it became accepted as a fact that the apple would not do well in California.

Later experiments, under more favorable conditions, have disproved this, but there still exists in many minds the old prejudice, generated by early failures, against apple growing for profit. This prejudice, however, is gradually giving way, as it is being demonstrated that California apples, properly cultivated and grown under favorable conditions, are superior to the Eastern product in size, keeping and drying qualities, and profitable yield, and in many of our coast and mountain counties, and in the higher altitudes of the interior valleys, apple growing is rapidly assuming its proper place as a profitable industry.

The northwestern part of the State, from the lowlands along the coast to an altitude of near four thousand feet in the Coast Range, has proved itself to be especially adapted to apple culture. The tree here grows very strong, and the fruit is all that can be desired. Humboldt and Siskiyou apples have a well-merited reputation for size and quality in the San Francisco market, and are known over the whole State for their superiority. Last season one hundred and forty-two carloads of apples were shipped from Siskiyou County to the East, mostly to Chicago, New York, and Boston, where they were the favorite in competition with the choicest Eastern fruits. They were shipped in forty-five-pound boxes, and kept perfectly well, arriving at their destination in excellent condition. The favorite varieties in this section are the Yellow Newtown Pippin, Wine Sap, Spitzenberg, Northern Spy, White Winter Pearmain, and Baldwin.

In the northern part of the State, along the course of the Smith, Klamath, Trinity, Mad, and Eel Rivers, are grown as handsome and finely flavored apples as can be found in the United States. Many varieties of late keepers retain their flavor and keep sound as late as July and August.

Excellent apples are also produced in the counties on the eastern slope of the Sierras, and some of the older orchards in Lassen County are reported as paying remarkably well. In Shasta, Tehama, Butte, and other counties of the Sacramento Valley, favored localities are found especially adapted to the growth of the apple where it has proved a very valuable and profitable crop. Nevada County reports three thousand seven hundred acres in apples, which this year yielded more than the average crop, and found a ready sale at fair prices.

The apple does well in Mariposa County, and an orchard of some one thousand five hundred trees in the Yosemite Valley, planted by its first pioneer, James Lannon, has yielded good results. The apples from this orchard are large and beautiful, but the soil being granitic in character, with an absence of clay, the flavor of the fruit is not equal to that produced in some other sections.

In the foothills and mountains of Fresno Flat, at an altitude of from one thousand nine hundred to four thousand feet, can be grown as fine apples as can be desired. A variety which prospers above all others in this region is the Yellow Newtown Pippin, which does not shrink, keeps in perfect condition until the first of July, and always commands a good price.

There is no region in the world better adapted for raising apples than the foothills and mountain regions and the numerous little valleys embraced therein. There are many thousands of acres of virgin land in the mountains along the east side of the San Joaquin Valley where the apple can be grown to the greatest perfection. In Fresno County, at the

base of the Sierra Nevada range, at an elevation of four thousand feet, Mr. Todd has fifteen acres in young apple trees. Some of these at five years of age bore last year four hundred and fifty pounds of fruit to the tree. The fruit possessed excellent keeping qualities, and was disposed of in the spring at 6½ cents per pound to local dealers.

The apple crop of Santa Cruz County in 1890 yielded two hundred and fifty thousand fifty-pound boxes, which sold for \$123,000, and the returns for the present season give promise of even better results.

In the foothills and higher table-lands of the Sierras, in Tulare and Kern Counties, apples remarkable for beauty of appearance, flavor, size, and keeping qualities are produced, and these qualities are found in all the apples grown in the Sierra foothills and cañons.

Very good apples are also grown in portions of the extreme southern end of the State. In speaking of the apples grown there, Mr. Earl, of the Earl Fruit Packing Company, says: "The apples grown here are very fine of their kind. We have bought a quantity of the red winter varieties (Wine Sap and Spitzenberg) for shipment to Australia and Japan. The finest Southern California apples are the Bellflower and White Winter Pearmain. Some of the apples from the mountains of San Bernardino are especially fine."

One of the oldest and most successful apple orchards in the State is that of Senator F. C. De Long, of Marin County. It covers one hundred and fifty acres, a large part of which has been in bearing since the latter part of the fifties. The prevailing varieties are the Yellow Newtown Pippin, White Winter Pearmain, Spitzenberg, Wine Sap, Roxbury, and Baldwin. During the past season the orchard did more than usually well, although it was found necessary to keep up a constant warfare on the codlin moth and canker worm. The larger portion of the fruit from this orchard is shipped to Australia, where it finds a ready sale. The apples are carefully selected, and packed with care; each one is examined to see that it is perfect, and is then wrapped in paper. They are then packed in boxes, forty pounds to the box, and loaded on the steamer. The past season Mr. De Long's fruit netted him \$1 65 per box on the wharf, and out of one thousand boxes shipped by him but sixty were reported as not having reached their destination in first class condition. The culls and poorer specimens are used for cider and vinegar.

Among the more favored late varieties are the Yellow Newtown Pippin, Yellow Bellflower, White Winter Pearmain, Ben Davis, Rhode Island Greening, Esopus, Spitzenberg, Jonathan, and Baldwin, all of which possess good qualities. The favorite early varieties include the Caroline, Red June, Early Harvest, Red Astrachan, Gravenstein, Fall Pippin, and King of Tompkins County. Of the latter a very excellent illustration is given herewith. The fruit is large, globular, angular, inclining to conic, yellowish, mostly shaded with red, striped and splashed with crimson; stalk short and stout, in large, somewhat irregular cavity; calyx small, closed; flesh yellowish, rich, juicy, vinous, aromatic.

Owing to the fact that apple culture and curing have received less attention than has the culture of many other fruits in the State, it is difficult to obtain accurate data as to the output of the crop or the profit attached to it, but there are many growers who have good apple lands who make the statement that they consider apple growing under favorable conditions as remunerative as orange growing.

Dried fruit this year has brought from 6½ to 7½ cents for pound lots of

good to choice evaporated, in boxes; 4 to 4½ cents for ordinary sliced in sacks, and 3½ to 4 cents for common quartered.

The apple is king among fruits, and as such demands our best efforts for its preservation and improvement. While the apple is preëminently the king of all fruits, and the tree is among the most hardy, vigorous, productive, and widely disseminated of all our large fruits, it is not without its enemies and diseases.

There are insects, parasitic and others, that prey upon it, and various fungi that feed upon the foliage and fruit. The twig borer, though not common, sometimes affects our apple trees. The most destructive enemy of the fruit, if neglected, is the codlin moth, but the ravages of this pest can be easily checked if proper measures are taken. A thorough spraying of the tree twice during the period of the setting of the young fruit will be sufficient to destroy the pest and insure the perfection of 75 per cent, or even more, of the crop.

D. M. Locke, Secretary of the Santa Cruz County Board of Horticultural Commissioners, has issued an excellent address to the fruit growers of his county, in relation to the care of apples, from which the following is taken:

"Good bands of double thickness of burlap, say at least six inches wide, should be placed around every bearing tree, and well looked after every week as long as fruit is upon the tree.

"All apples, as soon as gathered, should be removed to some distance (not yet fully determined) from the orchard, or deposited in a moth-tight apple-house, for they are all infested with the eggs of the moth, that will continue to hatch out, and the larvæ will take shelter in the boxes and shelves, in the floors and ceilings of the apple-house, until spring brings a new crop of apples; then the fertile moth comes forth at night and sees to it that every one of these tiny apples has at least one egg. Now, if the apple-house had been air-tight, they could all have been destroyed there. Some apple growers have these houses now, and others must provide them. They are neither difficult nor costly of construction.

"The ground is a good enough floor for this purpose, and the walls and ceilings may be covered with board paper or matched stuff, or lathed and plastered, and the ventilators secured with wire cloth.

"In these moth-tight rooms we have learned another lesson in the habits of the codlin moth. We find that the larvæ from the previous year's apple crop continue to hatch out moths, not only all summer, but into the fall. If in here, why not in other places where the environment to them is the same? So it seems certain that the codlin moth will survive the entire loss of one year's fruit crop and be on hand for the next."

The woolly aphis is a common pest, and is easily subdued by the application of gas lime for the root form and rosin spray for the branch form. There are also now several ladybugs that have been discovered feeding upon this aphis, and others are now being introduced from Australia, which are said to rid an orchard of aphis in a very short time.

THE APRICOT.

In no State in the Union does the apricot flourish so well or yield such early and large returns as it does in the greater portion of California. In a few of the extreme northern and eastern sections, regions of

high altitude subject to late frosts, the apricot cannot be relied upon as a profitable crop, but in the greater portion of the coast counties it is a favorite orchard tree. For the past season good crops and good prices are reported. The dried product has held very steady, with decidedly limited offerings of good to choice quality at 8½ to 9½ cents for the better grade in boxes, and 6½ to 8 cents for fair and choice in sacks. The ordinary sun-dried fruit sold at 3½ to 6 cents per pound.

In preparing the apricot for market, the fruit should be thoroughly ripe before gathering, and should be handled carefully in packing or carrying to the drying ground. After the pits are removed the halves are arranged on trays, the cut side up, and then put in the sulphuring box to close the pores and cause the fruit to retain all its fresh and desirable qualities in evaporating or drying.

In the "American Agriculturist," Ninetta Eames gives an excellent account of the apricot in Ventura County:

"In the cultivation of most fruits California is forced to compete with various portions of the United States, but for all practical purposes apricot growers have the entire world for a market. The climate and soil of many parts of California are peculiarly advantageous for bringing this luscious fruit to its highest perfection. The trees rapidly attain a luxuriant growth, and require vigorous annual pruning and watchful care to prevent the branches from breaking with the weight of fruit. Especially is this true in locations where the soil is a deep, rich loam and well drained. The pits sprout easily, and the young trees are ready for budding in June or July. The peach root is largely used for the apricot, though various other stocks are successfully employed, thus giving it a wide adaptability to different soils. Fruit growers are beginning to realize that the demand for this fruit is far in excess of its present production, and that any possible increase for years to come is not likely to exceed a profitable limit. It is necessary to use greater caution in the selection of a site for an apricot orchard than for the culture of other California fruits. In orchards near the coast the apricot 'points its best branches to the ocean, and the landward limbs and twigs bend up and endeavor to reach in the same direction. This is patent in every tree, and in the long rows is very striking.' This cannot spring from an inherent partiality to the sea, for the apricot is known to do equally well in land-locked valleys and foothills, where it is sure to ripen earlier. Coast apricots, on the contrary, are late coming to market, but the skin and pulp have a richer color than the same varieties produced in the interior. As the bulk of the crop is usually dried before shipment, it will be readily seen that a situation near the sea has the grave drawback of too much moisture in the atmosphere. Machine drying has not proved as satisfactory or as cheap as sun drying, and the latter method is in more general use.

"The immense quantities of apricots raised in coast counties are shipped to the interior to be dried in the open air. The largest drying floor in the State used exclusively for apricots is at Newhall, a beautiful little town set amidst sunny grain levels, everywhere dotted with the greenest of live oaks. The air here has the hot, dewless quality belonging to the inland mountains of California, and fruit exposed to it will dry with astonishing rapidity. Last year the orchardists of Ventura sent two hundred and seventy-five carloads of their apricots to the drying yards at Newhall, a distance of fifty miles. They were paid

\$200 a carload by the drying firm. The firm were at the additional expense of freight, pitting, and drying, making a total cost to them of 8 cents per pound. They sold the product for 13 cents, leaving as their profit 5 cents per pound. The apricots arrive at Newhall at the rate of seven carloads a day, and several hundreds of persons, old and young, are employed at the drying-sheds during the season, which lasts from six weeks to two months. Within fifty-six hours from their shipment at Ventura the apricots have been handled, dried, packed, and placed aboard cars bound for the Eastern market.

"A recently invented pitting machine bids fair to do away altogether with old-fashioned methods of preparing fruit for drying. Within the space of ten seconds there are fifteen revolutions of its wheel, and at each revolution four apricots are cut in half. At this rate three hundred and sixty apricots are pitted in one minute. It is estimated that the machine will pit four tons of fruit in a day, thus doing the work usually accomplished by eighteen men. Before spreading the cut fruit on the trays to dry, it is first subjected to the fumes of sulphur, to set the color and prevent oxidation. Care is taken to avoid over-sulphuring. Twenty to thirty minutes is considered sufficient, the riper fruit requiring the shorter time.

"In 1889 the first carload of apricots sent to New York sold for 21 cents per pound within half an hour after its arrival. In that year Southern California alone reaped a harvest of \$280,000 from this fruit. Last year's shipment of canned apricots reached as high as half a million cases. Of all the fruits canned in California the apricot is the favorite in the New York and Chicago markets. Though large quantities of fresh apricots have been sent East, this method of disposal is not in favor, owing to their liability of damage.

"Unlike many other varieties of fruit the apricot is inclined to wilt and become leathery if picked before fully ripe, and consequently is greatly deteriorated when it reaches its destination.

"Among the various varieties of apricots tested the Royal is probably the most popular kind grown in California, though the Hemskirke, Blenheim, and Moorpark are also favorites. The latter has an orange skin, freckled with numerous dark specks, and is delicious in flavor. Like the Royal, it is excellent for both canning and drying, and is a prolific bearer, upward of one thousand pounds being frequently gathered from a single tree. The Royal is an earlier apricot, and of lighter color than the Moorpark. Its velvety, yellow skin is tinged with a faint carmine on the cheek next the sun, and when not allowed to overbear, it is justly estimated as one of the handsomest varieties grown.

"Thorough cultivation is essential to the best results from an apricot orchard. If the soil is worked perseveringly, irrigation will be usually found unnecessary. Wherever the apricot thrives peaches also do well, though not all lands that produce the peach are adapted to apricot culture. The two fruits make an advantageous combination as regards the disposition of the crops. The better varieties of peaches do not appear until after the apricot season is past. This makes it possible for the small orchardist to handle both crops with little or no hired help, while the same methods are equally available in the management of the peach.

"In the early summer, after the pink flush of blossoms is blown from the leafless branches, an apricot orchard has a renewal of beauty that

only terminates with its full fruition of 'apples of gold.' The tops of the trees are feathered with innumerable young branches of delicate shades of red, which are in exquisite contrast to the poplar green of the lower leaves. This effect remains all during the formation of the growing fruit and far into midsummer, when the bee-haunted orchard is odorous with its yellowing burdens."

PEACHES.

A more than average peach crop is reported this season. In a few locations orchards have been injured by water, but on the whole the crop has been a good one and in advance of the yield of last season. Prices, however, have not ruled so high as last year, when the almost total failure of the crop in the Eastern States created an extraordinary demand for California fruits at phenomenal prices. Fair returns for good fruit, however, have been the rule. Unpeeled dried peaches ranged from 5 to 6 cents for good to choice; peeled peaches commanded 9 to 11 cents.

In regard to the profitableness of the peach crop in sections favorable to its growth, it is reported that an eight-acre orchard, the property of Giblin Bros., near Yuba City, the trees of which are now three years old, paid its owners at the rate of \$362 50 per acre. Of this amount \$2,814 was received for fruit sold to the cannery, and the remainder was sold to other parties. From one hundred and fifty acres of fruit in the Abbott & Phillips orchard in the same vicinity, the owner realized \$200 per acre, or \$30,000 for the orchard.

C. E. Williams, in his paper on "Fruit Growing in the Sacramento Valley," gives the early history of the peach:

"The first peach trees planted in the Sacramento Valley were set on the banks of the Yuba River, some two or three miles above the city of Marysville. There in 1852 was planted the first peach orchard of that section, and probably the first in the State to assume prominence from a commercial standpoint, although peaches of very inferior sorts had been grown by the Spaniards for nearly one hundred years previously.

"From the small beginning there made by George C. Briggs, the business has increased until there are now in the Sacramento Valley and adjacent foothills almost twelve million peach trees, of which one and one quarter million are in bearing. A conservative estimate of the value of these orchards is from \$5,000,000 to \$6,000,000. The annual product is not less than one hundred and fifty million pounds, which should be worth not less than \$3,000,000, or a gross return of \$150 per acre. Of this \$3,000,000 a large part is expended for labor in the orchards, and other large amounts are paid by the canners, shippers, and driers who handle the product. This great sum of money is paid to the working men, who immediately distribute it among the various classes of merchants, and thus it at once enters into the regular channels of trade, benefiting all more or less."

In regard to the best varieties for the market, W. J. Wilson & Son, of Placer County, who ship a great deal of green fruit East, state that for table use the freestone varieties are the favorite:

"A comparison of prices realized in such cities as Boston and New York during last season, would lead many to suspect that the clings had established themselves so far in the lead as to leave no doubt concerning

their superiority over the freestones. The explanation of the matter is that the clings were of standard varieties, such as the McDevitt and George's Late, and being allowed to properly mature before picking, they attracted attention when placed upon the Eastern markets, and as a result commanded very high prices. Growers need not concern themselves about the fear of overproduction of either clings or frees, provided standard varieties only are cultivated."

In this connection it may be well to say to those irrepressible pessimists who are eternally declaring that overproduction is an obstacle that may result in the producer's ruination at any time, that in New York City alone last year there were sold of oranges, lemons, grapes, bananas, and pineapples, a quantity equal to sixteen thousand carloads, while two hundred and seventy-five carloads represents the entire amount of California fruit sent to that city during the same period.

Such clings as the Orange Cling, Lemon Cling, Runyon's Orange Cling, McDevitt's Cling, Phillips' Cling, McDevitt's Cling, and George's Late Cling are desirable, owing to their richness of color, largeness of size, and superior shipping qualities. All are good bearers, a quality much sought after by growers, and ripen in the order named. In freestones the grower is recommended to such varieties as Early Imperial, Hale's Early, Crawford's Early and Crawford's Late, Foster, Susquehanna, Muir, and Salway. Many object to Hale's Early as being an undesirable peach, but the fact remains, nevertheless, that its earliness and good size render it a valuable addition not to be overlooked.

But little mistake can be made in planting peaches, provided soil and climate are adapted to their growth, proper varieties are selected, and proper attention paid to them. While California is not the only peach-growing State in the Union, it has advantages enjoyed by no other. Its fruit is earlier, larger in size, superior in flavor, and the trees begin to yield profitable returns much earlier than in the East. Another advantage possessed by her is in the fact that destructive diseases which are now ravaging the orchards of the East are unknown here. The "yellows," which has proved fatal to vast peach areas in the Eastern States, has not obtained a foothold in this State, and with the vigorous system of quarantining introduced by the State Board of Horticulture, but little danger from that source need be apprehended. With these advantages, and without serious diseases affecting our trees, the demand for California peaches will increase each year, and there will be little danger of overstocking the market with the fruit at fair prices.

THE PEAR.

One of the most hardy and most profitable fruits of California is the pear. It is a hardy grower, will stand a great amount of ill treatment, and thrive under conditions where other trees would fail. It does well on the coast, in the interior valleys, and on the foothills. In soil it has little choice, thriving in the hard adobe, the richer alluviums, and the sandy loam, while even in land impregnated with alkali it will grow and bear fruit. It does best, however, on the heavy alluvial lands of river bottoms, where it attains its largest growth and gives the greatest returns. While the pear will bear a great deal of neglect and exist under it, returning fair crops, it appreciates good treatment and amply repays the care bestowed upon it, and if properly cultivated and cared

for it will yield large returns to the grower. Its fruit possesses excellent keeping qualities, and can be shipped in its green state, canned, or dried. Shipped green it reaches the market in its prime condition, and the pear has done as much for the upbuilding of California's reputation in the East as any other one fruit.

In regard to the most profitable varieties of pears, General Chipman says:

"The pear is one of our most profitable fruits. The pear has almost disappeared in the East as an article of fruit commerce, and the yield is always precarious. The canning of pears on an extensive scale was left to California. Summer pears should be gathered ten days before they are ripe, and autumn pears two weeks. Winter varieties may hang, if they will, until the leaves begin to fall. Don't let your trees overbear; thin out when the fruit is small. Of the summer pear, there is no use planting any but the Bartlett. It is good for market or canning; large, buttery, with rich musky flavor; erect grower, bears young and abundantly. Other good summer pears, such as the Le Conte, Clapp's Favorite, Souvenir du Congress, are on the lists, but their resemblance to the Bartlett is their chief recommendation, and why buy an imitation when you can get the standard genuine? Of autumn pears, plant Beurré Clairgeau. It is highly flavored, valuable for market, bears transportation, ripens in October and November. Beurré Hardy, Duchesse d'Angouleme, Kennedy, and Seckel are all good.

"Of winter pears, plant Easter Beurré, keeps December to March; Winter Nelis, December. The Winter Nelis is a good shipper and valuable for market. Unless you are planting several varieties to meet shipping and market wants for green fruit, I would stick to Bartletts, because if you can't ship the canners will take them.

"If you want a winter pear to follow up your Bartlett, plant the Winter Nelis. Mr. Gray, General Bidwell's former Superintendent, stated before the State Horticultural Society that there is no fruit that will bring in as much money to the northern part of the State as the Winter Nelis. He says they sell all they have at 2 to 4 cents a pound and could sell more. He further says: 'We have never had a failure, and it seems to be a very profitable tree, yielding from \$400 to \$700 or \$800 an acre.' At the same discussion, Mr. Stone, of Compton, said his Bartletts yield \$5 or \$6 to the tree.

"Strong, rich, sandy loams are good, and these pears also do well on heavier soils; indeed, in some places, the heavier soils are the best."

THE CHERRY.

California cherries, like all other fruit products of the State, are remarkable for their size, flavor, and beauty of appearance. Their size dwarfs that of their Eastern competitors, and even when grown from imported stock the favorable condition of soil and climate renders the fruit so much superior to that grown in the East as to cause experts to doubt whether it is the same variety. It is told of an Eastern pomologist, who had sent trees to Alameda, that he was once present in the fruiting season of the orchard, and could hardly be convinced that the fruit he saw there grew upon his trees.

The cherry crop of California, while it aggregates a large amount, does not take rank among the first fruits in quantity of output. It is

far exceeded by the orange, prune, raisin, peach, and pear; yet it has always been found a remunerative crop under favorable conditions.

Alameda and Santa Clara Counties are the chief cherry-producing sections of the State, and from there nearly one half the output is made. Next in order come Solano, Napa, Placer, Sonoma, Santa Cruz, and Sacramento.

Experiments with the cherry in the hot, dry interior valleys have not proved successful, and it is generally accepted as a fact that it does not do well there, although some varieties, where tried, have given good results.

The cherry does best on a sandy loam, of good depth and well drained. It does not do well in heavy clay soil or on adobe. Probably the largest cherry trees in the United States are owned by Robert Hector, on the North Fork of the American River, near Newcastle, in Placer County. One of these is nearly ten feet in circumference and over eighty feet in height, and its yield the present season was three thousand pounds. Three hundred ten-pound boxes were packed from this one tree. It is of the Black Tartarian variety, and was planted in 1853. The location is particularly favorable for cherry growth, being an amphitheater, protected on all but the south side by hills. The soil is a very deep, warm, dry loam.

The stock mostly used in this State is the seedling or wild cherry, many varieties of which are hardy and strong growers. The Mazzard, a wild cherry of Europe, is preferred by many. Where dwarfed trees are desired, the Mahaleb stock is used.

In planting care should be taken to select good, well-drained, sandy loam, which should be plowed at least twelve inches deep and well harrowed. The trees should be set thirty feet apart, or more. After planting, the young trees should be cut off two feet from the ground, leaving the last bud uninjured about half an inch from the top. Cover the top with hot wax and cut off all side limbs. At the second pruning three to five limbs, twelve inches long, should be left, cutting off all the rest. On upright growing trees the branches should be cut to an outside bud, and on those of a spreading habit to an inside bud. At the third pruning cut back one half or two thirds, and thin out to make a well-balanced and good proportioned tree. The fourth and fifth prunings will be about the same, after which but little pruning is necessary. In cutting old cherry limbs it is necessary to cut to a crotch, as the stub will die and likely involve the life of the tree. It is also an absolute necessity to use hot wax on the severed limbs.

Respecting varieties of cherries, a noted author writes:

"There are quite distinct groups or families in cultivation—two of the sweet class and two of the sour or acid class. The first, or sweet group, with mild, sub-acid fruit, are trees of rapid and large growth, and are divided into two sub-groups. The Bigarreus, with firm-fleshed and meaty fruit; these are white, yellow, red, and black. The Napoleon Bigarreau and Yellow Spanish are types. The Hearts, more usually with heart-shaped fruits, with softer, sweeter pulp than the first group, but of the same colors. The Black Tartarian and Early Purple Guigne (pronounced 'jean') are types of the heart-shaped group. These divisions are arbitrary, but they are useful for classification.

"The acid cherries are divided into two sub-groups, and are a little more clearly defined. They are the Dukes and Morellos. The Dukes,

in general appearance, are about half way between the Morellos and sweets. The trees are small, and generally of an upright growth. The fruit is generally acid or sub-acid, though the sweetest cherry when ripe, the Belle de Choisy, is placed in this sub-group. The May Duke and Carnation are types of this group. They all do finely on this coast. There are some very fine dessert cherries among them, if allowed to become fully ripe. The May Duke, nearly black—Reine Hortense—perhaps the most desirable on this coast, is a beautiful tree, and an enormous bearer of large, delicious fruit. The Belle de Choisy is a very pretty light coral red, round, sweet, and delicious. The tree is very erect, and is a great bearer. The trouble with the Dukes is that they are rather watery and tender for cooking, too soft for shipment, and rather acid for dessert use. The May Duke, however, comes near being an exception. It is highly prized everywhere, and especially where the climate is a little too cold for the sweets.

“The Morello group comes last. These are usually small, round-headed trees, with slender, drooping branches and small, thick leaves. This group is divided into two sub-groups, one of which is the Kentish or Early Richmond, Early May, etc. It is a small, round, red, soft, acid fruit. It ripens early and quickly. The fruit, though watery, is highly esteemed for pies and canning everywhere except in California. There are several better, though later, cherries in this group than the Kentish. The Montmorencies belong in this group. Their foliage is smaller than either of the other groups and healthier in an unfavorable climate. These are the renowned cherry pie fruits. They are very dark red—nearly black—mostly round, quite firm in skin and flesh, and very acid. Some of them are very rich when fully ripe. They ripen very slowly and are used for pies weeks before they are ripe. Few people know how good the common Morello is when thoroughly ripe, simply because they never saw a ripe one. The common black Morello, the type of the group, is the hardiest and healthiest of our old varieties of cherries. Some of the varieties of this class are red and light red, but none are as good as the common black Morello. The black English Morello is the largest of the class. The tree is small, conical, enormously productive, late, and very acid, much like some of the plums and ripe American gooseberries, so acid that sugar will not sweeten them. This was once the most profitable cherry in the East, but the plum curculio eventually destroyed all the fruit.

“The Chicago market is usually abundantly supplied with cherries from the eastern shore of Lake Michigan. The sour cherries bring about double the price of the sweets, and are taken in unlimited quantities. The same is true in other large cities.

“Here is a hint to the fruit growers of this coast: There is money in the Morello group of sour cherries. They are prolific bearers, are much healthier and hardier than the sweets, are better shippers, and, when cherries are plenty, bring more money. The Montmorencies are perhaps really the best, but the English Morello sells best, though it may be the poorest cherry in the world. It makes fine sweet pickles.

“Professors Budd and Gibbs have selected and imported many fine, hardy varieties of sour cherries from the north of Europe and Russia. Some are showing good promise. This coast is sending fine eating cherries East, and leaving the demand for culinary cherries unfilled.

There is no shipping market for soft, red, sour cherries, but there is for the right varieties."

A dwarf variety of the cherry known as the sand cherry (*Prunus pumila*, L.), is a native of the Dakotas. It is found throughout the valleys of the James and Missouri Rivers. It grows readily from the seed, and can be propagated from root cuttings. It is a rapid grower, and begins to fruit the third year from the seed. It is the most dwarf of all the cherries, growing in the form of a bush, like the currant, and seldom attains a height of more than four feet. It branches freely, and when in full flower, in the month of May, it is an ornamental object. The flowers are produced in clusters of two or three from every bud on the one-year old branches. They appear with the leaves, the blossoms completely hiding the young leaves from sight. In size they are like the bloom of the wild plum, in all other respects resembling closely the flowers of the cultivated cherry. They differ from the other forms of wild cherry (*P. scrotina* and *P. virginiana*) in the flower cluster, the latter having their flowers in drooping racemes.

Classifying roughly, according to the fruit, we find yellow and black fruited sorts. The yellow-fruited sorts, as a class, are earlier than the blacks, and of rather better flavor. They are greenish yellow when fully ripe, and vary in size, the largest being about the size of a medium Early Richmond cherry. In quality they differ greatly; on a few bushes the fruit is almost free from the crude "puckery" flavor common to all wild cherries, but the majority are no better than choke cherries. The stone is as large or larger than in the Early Richmond, and the pulp is very watery, having little substance. The skin is rather tough, and varies greatly in thickness and stringency in different plants. Cherries selected for size and flavor were cooked, the fruit of several plants being cooked separately, the pits being removed in all cases before cooking. The best gave an insipid sauce, having little of the character of the cultivated form of the cherry, and yet good enough to be relished where no other fruit can be had. A jelly of inferior quality, of a light yellowish green color, was made from the juice pressed from the fruit before cooking. Jam made from the fruit was less palatable than the stewed cherries. As the fruit is very juicy the jam consisted almost entirely of the skins.

The dark-colored sorts range from dark red to deep black, and in size, quality, and season vary as much as do the light-colored kinds. Seeds have been saved from the best of all the bushes, and their action under cultivation will be observed.

While of little value when the quality of the fruit is considered, it would seem that these dwarf cherries should give rise to a race especially adapted to the West. They have withstood all the dry weather of the past three years without injury, and they have been covered with bloom for two seasons, though unprotected during the winter. Their flower clusters and fruits show a close relationship to our cultivated forms, and hence crossing with the latter should be feasible. In this way varieties having qualities superior to the natives may be secured. This variety is wholly unknown in California, but it is not improbable that by means of careful selection a variety adapted to our climate, and possessed of advantages for some sections, might be secured.

THE FIG.

Considerable interest has been taken in fig growing of late years. This interest has been heightened by the report of this Board for 1889, wherein the subject was very thoroughly dealt with. The introduction of the *Blastophaga*, said to be the fecundating insect of Smyrna, by Mr. James Shinn, of Niles, and the discussion of its merits in the matter of caprification, have further added to this interest. As yet the fig cuts no large figure in our exports of fruits, although some species do well in most portions of the State, and the most tender varieties make an excellent growth in some portions. Much discussion has been indulged in as to whether California had the true Smyrna fig. To set this at rest the State Board of Horticulture procured direct from Smyrna a shipment of fifty well-rooted four-year old trees. These arrived in excellent condition and were distributed over the State. Over two thousand applications for trees were made to the Board, and out of these careful selections were made, considering locality and facilities for cultivation and care. Reports received from some of those who received these trees show that they have done well, in some cases a growth of over two feet having been made. The wide distribution of these trees gives an assurance of a thorough trial of the Smyrna fig in the various sections of the State, and a guarantee of the spread of the genuine fig of commerce wherever it shows its best qualities.

Some very excellent figs have been produced by Hjalmar Newman, at Porterville, Tulare County, who gives the following as his experience in the treatment of the fruit:

"The best figs for drying are raised in the district of Aidin, in the valley of the Mender, and the peculiarity with this kind of fig is that they are not palatable when fresh, but delicious beyond comparison when dried. At the packing-houses in Smyrna these figs are assorted, and the best packed in shallow wooden boxes, branded *Elemé*, and the second class packed in drums. As cuttings from the trees in Aidin, when transplanted in other localities, only produce very inferior fruit, it seems to me that soil and locality are of more importance than is generally believed. The true *Elemé* fig is seldom brought to the United States of America, but figs from the valley of Lucania, Calabria, and Terra d'Otranto are used as a substitute. On what large scale the fig industry is carried on in this part of Italy, we may get an idea, when we hear that two small communes—Galatina and Cutrofiano—yearly prepare and export about two million pounds of dried figs. In the vicinity of Naples enormous quantities of figs (mostly *Fico de Oro*) are produced, but nearly all are consumed fresh. Here I will mention that the Californians have not yet learned how to eat figs in a proper way. An Italian seldom eats figs without bread.

"Other localities in Italy and countries around the Mediterranean Sea have nearly all their different ways of curing and packing the figs. Some peel the figs before drying; some split them; some bake them in ovens; some stuff them with walnuts or almonds, or season them with thin shavings of citron peel or cinnamon, cloves, anise, and fennel; some roll them in flour; and some dip them in honey, cook them in copper-lined kettles, and put them up in varnished earthen pots. Figs thus prepared seldom find their way outside of Italy, as they are chiefly used as gifts to friends, and the supply is very limited. The refuse of the

Smyrna fig market and all the inferior fruit from places where first class figs cannot be successfully produced, finds its way to the Austrian 'chicory coffee makers,' or to the French distilleries, in which latter places the figs are converted into fine champagne, wine, cognac, and vinegar. The liquor known as anisette is made in Spain from figs, also the ardent spirit aguardiente. In France early figs are obtained by pricking the eye of the fig with a needle dipped in sweet oil. Thus we find that the fig producers around the Mediterranean Sea, by making their fruit palatable and useful in many different ways, always find a good market and make their orchards pay, although very few have the privilege of location in the valley of the Mender.

"Coming generations, who will have their main living from the California fig culture, will bless our efforts even when our names are forgotten, and the weary laborer or invalid who seeks refuge from the summer heat under the dense foliage of California's grandest fruit and shade trees will surely send a sigh of thanks to the man who took the trouble to plant them. To reach the goal we must labor together, and frequently relate our experience in fig culture in order to correct and be corrected.

"What I consider the most important for the success of a fig orchard is the choice of locality. My fig trees, Fico di Fragola, or Strawberry fig (here called 'White Adriatic'), are planted on dry bog land near Porterville, and I have chosen this locality for the following reasons: The dryness of the climate, the warm nights, absence of fog, its rich and warm soil, and facilities for irrigation. The trees receive water in abundance up to the first of July, but from that date not a drop. I use dwarf pruning, and take good care to prune my trees inside in order to let in air and sunshine; all suckers and weeds are strictly prohibited. I pick the fruit when perfectly ripe, and dry it without using any sulphur or lye. The largest figs, and also such as may burst open, are split lengthwise and cured in the same way as Dottati figs in Tuscany, *i. e.*, seasoned with anise, or fennel seeds. All figs are dipped in boiling water before packing.

"The Dottati figs I mentioned above are supposed to be identical with the figs that Plinius says were brought by Lucius Vitellius from Soria to his villa at Alba."

THE OLIVE.

In the year 1889 the subject of olive growing was very exhaustively treated in a bulletin issued by this Board. The industry at that time had become an important one, and increased attention has since been directed to the growth of the olive for its oil and for the table. A difficulty which met our growers was the competition of cheap, adulterated oils, domestic and imported. So formidable was this difficulty that it was determined to organize the oil men of the State into a protective association, and for this purpose a meeting was held at the rooms of the State Board of Horticulture on July 8, 1891, and the organization adopted a label for their oils, which were guaranteed pure, and Justinian Caire, of San Francisco, was appointed agent of the association to handle its products.

The following Board of officers was elected for the year:

Ellwood Cooper, Santa Barbara.....	President.
John Bidwell, Chico	Vice-President.
Justinian Caire, San Francisco	Treasurer.
B. M. Lelong, San Francisco	Secretary.

The membership was divided into two classes, active members being those actually engaged in the commercial production of oil, and honorary members being those engaged in olive growing, but who have not packed oil for the market. So soon as an honorary member becomes a producer of oil for the market he is entitled to full or active membership.

While the olive oil industry has been a slow one, it has none the less made satisfactory headway. Ten years ago the only brand of oil put up in the State for the market was that manufactured by Ellwood Cooper, at Santa Barbara; to-day there are fifteen active members of the association who have registered labels, and twenty-three honorary members who will soon enter the field as producers, besides numbers of others who have turned their attention to the industry within the past season.

Total Product by Years.

1888	590 gallons.
1889	1,142 gallons.
1890	5,202 gallons.
1891	11,011 gallons.

It should be further explained that the returns for 1891 are but partial, a large proportion of the oil being in process of manufacture when these returns were made. Enough is given, however, to prove that the olive oil industry is becoming one of great importance in the State, although as yet in its infancy.

When it is considered that the importation of foreign oil in 1890 amounted to 893,984 gallons, valued at \$819,110, while our domestic output will not amount to much over a seventy-thousandth part of that, it would seem that a good field is opened to the producer of olive oil in California.

The olive, so necessary to the every-day life of the Latin races of Europe, is largely a stranger in America, and our people have not yet awakened to its importance and usefulness as an article of diet. The olive is regarded by most people as an article of luxury and its oil as a medicine. This prejudice forms another obstacle in the path of California olive growers, that only the education of the people can remove. When it becomes known how much better an article of diet pure olive oil is than hog's lard, or even butter, there will grow up a demand for it that will make its production on a large scale profitable. This object the association is working for, and while the work is somewhat slow at the beginning, its success has so far been encouraging, and pure California olive oil is making a name for itself in the market.

The olive will thrive under distressing conditions, although it repays proper attention. It will do well on lands where other fruits would fail, and will be found to be profitable in much of the "waste" lands of the State. It will stand a winter temperature as low as 20 degrees without injury, and will live and bear fruit for a fabulous time. Some trees in Europe and Asia are still fruiting which are said to be over a thousand years old. In Europe no fruit is expected from the young trees until they have attained the age of seven years. In California they will

begin to bear in three to four years, and some precocious trees are reported in Santa Barbara to have borne as young as two years old.

During the year 1891 a great many olive orchards have been planted in various parts of Southern California, and in the coast counties. In Santa Barbara County a company, known as the Moramar Olive Company, has been formed, the purpose being to plant an extensive olive orchard on the Hall ranch in Carpenteria. The capital stock is \$150,000, divided into thirty shares of \$5,000 each. It is proposed for the owners of the ranch, which consists of five hundred and seven acres in Carpenteria and a valuable water right, to put in their property at a valuation of \$45,000, a part of which is to be taken in the stock of the company. C. F. Eaton, of Montecito, proposes to furnish the necessary olive trees to plant three hundred acres of the property, in part payment of which he will also accept stock. One hundred and fifty acres are to be set out the first year, and the balance the second year, and it is calculated that when the trees are four or five years old they will yield a yearly revenue of \$25,000, which will increase as the trees grow older. The water on the property will be developed and piped for irrigating purposes.

THE RAISIN.

The raisin of late years has received more attention than any other fruit in California. The ease with which raisin vines were propagated, their early returns of profit, large yield, and the good prices, gave an impetus to the industry which has been remarkable. In the winter of 1890 there were reported sixty-eight thousand eight hundred and thirty-seven acres of raisin vines in the State; to this may be added twenty-five thousand acres planted in the spring of 1891. Of these there are about one third in full bearing. The output for the past season was 2,641,590 boxes. Of this amount Fresno County has produced considerably more than half. The exact figures are: For Fresno County, 1,376,795 boxes, and for all the rest of the State, 1,264,795. Thus it is seen that Fresno produced 126,795 boxes more than all the rest of the State combined.

The total output of the State is 52,831,800 pounds for the season.

When it is considered that not more than one third of the raisin vineyards now planted are in bearing, and that it is estimated that ten thousand acres of new land will be set to raisins this season, the magnitude and importance of this industry to California can be appreciated.

A large portion of the crop this season was shipped in sacks to the East, where it was repacked in boxes. The rapid increase in the output of raisins in this State has had the effect of very materially replacing the imported article, and we may confidently expect that in a short time the United States, instead of being an importer of raisins, will become an exporter. Efforts are already being made to establish a trade in London for our fruits, and also to introduce them to other European markets. This has been forced by the present large yield and the prospective increase in the output, which will necessitate a larger market for the raisin product than the United States will afford.

Prices opened fairly well in the beginning of the past season, some of the earlier pack being contracted for at 5 cents in the sweat boxes. These prices, however, declined until 3 cents was reached, with the supply fully up to the demand. The New York "Commercial Bulletin," of

December 20, 1891, commenting upon the advance being made by the California raisin against imported fruit, says:

"The trade of the season now closing has been in strong contrast to the corresponding period of previous years. Instead of the heavy importations of raisins and prunes that had been made annually from Spain, France, Bosnia, and Servia, the business in these foreign products has been growing steadily less the past few years until it looks now as if California will, in time, succeed in monopolizing the entire trade of the country. From experiments at the beginning, only some six or eight years ago, the fruit-growing industry on the Pacific Coast has made wonderful progress, and if the same enterprise is shown in the next several years foreign raisins and prunes will undoubtedly be forced to seek a sale in markets other than in the United States."

The "Bulletin" discusses in detail the gradual introduction and growing popularity in the market of California Malagas, Valencias, and prunes. On Valencias, the paper says:

"Facts have proved that with the constantly increasing crop on the Pacific Coast, coupled with the introduction of a new style of packing in bags, the forcing of goods against the sale of imported has been rather an easy matter, and the trade prices of California this season have been abnormally low. This fact certainly has assisted the sale of home products. But on the other hand, when the difference was less great between imported and domestic, the latter stock in bags appeared to have a decided preference."

The raisin industry has been the outgrowth of the past twenty years. Prior to that time, while some thought raisins could be successfully produced in California, no efforts to grow them on a commercial scale were made. In 1873 a shipment of six thousand boxes was made from Yolo County, and from that time raisin growing advanced until it has become one of the most important industries of our State. As indicating the rapidity of its growth and its present importance, the following figures, showing the shipments for each year from 1873 to 1891, are given:

YEAR.	Boxes.	Pounds.
1873	6,000	120,000
1874	9,000	180,000
1875	11,000	222,000
1876	19,000	380,000
1877	32,000	640,000
1878	48,000	960,000
1879	65,000	1,300,000
1880	75,000	1,500,000
1881	90,000	1,800,000
1882	115,000	2,300,000
1883	125,000	2,500,000
1884	175,000	3,500,000
1885	475,000	9,500,000
1886	703,000	14,060,000
1887	800,000	16,000,000
1888	1,250,000	20,500,000
1889	1,638,900	32,678,000
1890	2,341,463	46,829,260
1891	2,641,590	52,831,800

The relative importance of the various raisin-growing localities may be seen at a glance from the following figures, showing the sources of the crop of 1890, these being the records of actual shipments made:

	Twenty-pound Boxes.
Fresno	1,050,000
San Bernardino	629,913
Yolo	300,000
San Diego	175,000
Los Angeles	40,000
Sutter	17,000
Shasta	6,000
Solano	14,000
Yuba	17,550
Santa Clara	40,000
Sonoma	15,000
Merced	17,000
Ventura	10,000
Colusa, Tehama, etc.	10,000
Total	2,841,463

The following table shows the quantities of raisins imported into the United States for the past eight years, together with the value thereof. While there has been an increased importation in the past two years over that of 1889, the general tendency is to a decrease. While there has been a material increase in the population of the country in the past eight years, there has been a considerable falling off in the importation of raisins, which indicates that the domestic is rapidly replacing the imported article:

Quantities and Values of Raisins Imported into the United States from 1884 to 1891.

YEAR.	Quantity— Pounds.	Value.
1884	53,702,220	\$3,290,150
1885	38,319,787	2,661,699
1886	40,387,946	2,885,123
1887	40,678,288	2,881,981
1888	40,476,763	2,070,120
1889	35,091,139	1,736,786
1890	36,914,330	1,997,103
1891	39,572,655	2,018,879

CHAPTER III.

NUTS, BERRIES, AND MISCELLANEOUS FRUITS.

WALNUT.

The English walnut (*Juglans regia*) flourishes exceedingly well in many parts of the State, and where soil and climate are adapted to its growth is very remunerative to its grower. The tree makes a remarkably thrifty growth in the fertile valleys of California both north and south, but its favorite habitat is in the coast valleys of Southern California, where it reaches its perfection both in size and fertility. Large quantities of nuts are produced in Ventura County, where the industry has become a prominent one. N. B. Smith, of Ventura, estimates the value of a fifteen-year old walnut tree at \$400, basing his estimate upon the value of nuts produced annually. On some trees in that county as much as \$60 worth of fruit has been gathered from a single tree. Near Rivera, in Los Angeles County, there is about a square mile in walnut trees, a large portion of which are not yet in bearing. From these last year the Walnut Growers' Association sold six thousand five hundred and thirty-six sacks, netting \$60,000. This season (1891) the yield will be fifty carloads. Last season the nuts sold for 8 and 10 cents per pound. As much as \$450 worth of fruit has been harvested from a single acre of walnuts at Rivera, and it is estimated that a ten-year old tree there will return an average of two hundred pounds, and increase in its output continually from that age.

George B. West, of Stockton, who has made a success in walnut growing, gives his experience this season with the walnut at Stockton, as follows:

"I propose to give my experience with the French walnuts, which I have had ample time to test, having imported them in 1861, and I must say in the beginning that it has been very satisfactory. Their growth is slower and the wood is much harder. There has been no freezing of the young shoots, but a regular, sturdy growth.

"They are fertile, bearing regular crops. Some of the varieties are so full of fruit that I have been obliged to thin them so that the crop would not injure the tree. The quality of the nut is excellent—far superior to the Los Angeles nut. The shell on most varieties is very thin, and the size of the nut on mature trees is fully up to the average. One variety, the A Bijou, is by far the largest nut grown in the world.

"A description of the varieties which I have tried is necessary in order to give the reader a correct idea of their value.

"*First*—The A Bijou, the largest walnut known. This variety began to bear when it had been planted four years, and has constantly increased its yield. Last year it bore a large crop, and this year it set its fruit so quickly that I thought best to remove at least one third of it. The reputation of this tree in its home, France, is that of a shy bearer. The quality is excellent; superior to anything I have ever seen.

"*Second*—The *Præparturiens*. This variety has proved exceedingly satisfactory. It will bear in nursery rows when not more than four feet high, and continue to have a crop every year, and has never been injured by spring frosts. On my place are seedlings of the second and third generations which still convey their fertile and early bearing qualities. The nuts on mature trees are of good size and of the best quality.

"*Third*—The *Serrotina*, or Late St. John. This variety came into bearing on the fifth year from planting. It is of less value than the preceding. Its flavor is not quite so delicate, and the shell is a trifle harder; but as it is a week later in showing leaf in the spring, it will suit frosty localities.

"*Fourth*—The *Mayette*. This is one of the varieties that is depended upon in France for a crop. My trees did not produce until the sixth year. They are a large, excellent nut, and reproduce themselves very true from seed.

"*Fifth*—The *Chaberte* is also a good, thrifty, hardy variety, and one grown in France for a good crop.

"All of the above kinds are of value in Northern California. They have proved successful in San Joaquin in the foothills, and there is no reason why all similar localities should not be equally successful. In the coast counties they would no doubt be much more at home, and although they can be grown in warm, dry localities, I believe their proper place is where they can feel the influence of the sea air; but as there are many people inland who would like to have walnuts grown at home, my experience in so warm a locality as Stockton may be interesting to them.

"The walnut requires a deep, rich soil; one in which the roots will strike deep, so that there can be no pinch in the hot summer weather.

"The worst enemy to this tree is the red spider, or *mite*, which, being a native of this State, is liable to attack the leaves in any locality where the air is dry. They can be combatted by spraying with the usual solutions recommended by the State Board of Horticulture.

"There is also a fungus which injured my trees two years in succession. It has nearly disappeared, and the trees are very healthy now.

"I would state, in conclusion, that I have no interest in the nursery business—no trees or nuts for sale. My object in writing this communication is simply to warn enthusiastic beginners against unprofitable ventures. None can be more so than the cultivation of the variety of the walnut.

"I could soon convince any one who would visit my place of the comparative value of the French and English kinds; both are grown under the same conditions; the English, large, old trees almost destitute of nuts, and the French, five varieties, all loaded with a healthy crop. I could show trees which have been planted only three years, having all the nuts that they should be allowed to bear.

"Experience has taught us that the seedling English walnut is a failure in Northern California. It is not perfectly hardy in the inland counties, making a strong growth while young, which is cut back by an extra cold winter, and when it has attained a size suitable for bearing a crop it proves to be barren. I have trees on my place thirty feet high, twenty years old, that have never borne twenty nuts in a year; this is the experience of most planters.

"Gathering the walnut crop is a simple process, and merely consists of picking up the nuts from the ground where they fall when ripe. But in order to have a bright, clean nut, it is necessary to gather them from under the trees every day; and to preserve the kernel plump and in a highly flavored condition the nuts, after they are gathered, should be dried in the shade. A good method is to put them in a tray, and spread out to a depth of from three to four inches.

"It is absolutely necessary that the soft-shell walnut be cared for as in the manner stated in order to prepare it for the market in a merchantable condition, owing to the thinness of the shell and its tendency to crack open and the kernel to shrivel up."

ALMOND.

The California almond had to force its way into the Eastern market in the face of a prejudice in favor of the imported fruit. This it has accomplished so well that, owing to its superior qualities, it sold in New York the present season, in October, 1891, at an advance upon the European article. Porter Brothers report having sold their 376 bags, 16,803 pounds, for \$2,844 61. The paper-shells brought 22½ cents, the soft-shells 16 cents, and the hard-shells 12 cents.

Almond culture has not received the attention that it should in this State. The tree does well on land that would not be considered first class for other fruits. It is a good bearer, if the right varieties are selected, requires but little care, and gives good returns. There is a good market for the product in the East, as is evidenced by the fact above alluded to, that California nuts bring more than those imported; and that there is a wide field for the California nut-grower is shown by the further fact that in 1891 there were imported into the United States 7,497,193 pounds of almonds from Europe, which were valued at the Custom-house at \$989,966.

Perhaps one reason why the almond is not more largely produced is that the Languedoc, a French variety, which has been generally planted, has not proved itself a profitable bearer. New varieties, seedlings, have been propagated in this State, however, that are reliable, and which yield certain crops, are very prolific, and the fruit of which is superior to the foreign varieties. This being demonstrated, there is no reason why California almonds should not soon replace the imported article, and the million dollars now annually sent to Europe to pay for these nuts be devoted to the upbuilding of this State.

Almonds are divided into three classes: the paper-shell, soft-shell, and hard-shell. Between these are others that blend the one into the other, and that cannot safely be classed with either variety. The paper-shell is the favorite in the market, and brings a much higher price than the soft-shell, while the demand for hard-shells is much more limited. The popularity of the California almond lies in the fact that its kernel is perfectly smooth and plump—qualities which are required by confectioners, who consume a very large proportion of the almonds produced and imported into the United States.

Almond growing presents many advantages, especially to the beginners in fruit growing. There is little to be learned about the business. The tree will bear much neglect, but repays careful treatment. No art is required either in gathering or curing the crop; the trees bear young

and bring early returns for the investment, and with the proper varieties and favorable conditions the crop is a profitable one. In the annual report of this Board for 1890, Webster Treat presents a very able and exhaustive essay on the almond and its culture, in which he states that when the tree is four years old it will bear an average of thirteen pounds to the tree, and last year there were taken from one hundred and ninety five-year old trees three thousand five hundred and two pounds, which sold in Chicago, at wholesale rates, for 22 cents per pound. This is at the rate of \$283 50 per acre on five-year old trees, planted twenty-five feet apart. Even from Languedoc trees there were gathered one year, when they happened to bear a good crop, fully one hundred pounds from one tree, which was twelve years old. With these fine new varieties that have been propagated in California, which bear much heavier than the Languedoc, and finer nuts, the prospect is for a very large yield when they are eight years old.

OTHER NUTS.

Among other nuts which give promise for the future the chestnut takes rank. But little attention has so far been given to it, but where grown it does well. It is adapted to heavy, clayey soils, and in California is a rapid grower. The varieties principally grown here are the Italian and the Japanese, the former being the favorite. The tree thrives in all parts of the State.

The hazelnut is native to the northern portion of the State, and can be found from the valley lands to the mountain tops. It is very productive and hardy, rarely, if ever, failing to produce a good crop annually. The bush is from three to eight feet high, and the nuts generally grow in pairs, sometimes three or four in a cluster, half an inch or more in diameter, incased in a thick, prickly hull, from which they are easily separated when ripe. It is found along the coast from Mendocino to Oregon.

Peanuts do well, and a number of experiments made with them in the season of 1891 give promise that they will soon become an article of export. In Tulare County C. J. Berry grew a large amount between the rows of a young peach orchard. The soil was a sandy loam, naturally damp, and the yield was very large, and the berries large and plump.

Pecans, filberts, and black walnuts are also grown to some extent, but not in sufficient quantities to warrant them to a position among the profitable products of the State.

CURRENTS AND BERRIES.

The currant crop of 1891 was not up to the average, nor was the fruit up to its usual standard. A hot spell which prevailed just prior to the ripening season had a blighting effect upon the fruit. The domestic demand was light, and the greater portion of the crop was disposed of to the canneries.

Berries generally yielded well, the strawberry crop especially being very large, and the fruit of more than usual excellence. Blackberries, raspberries, and gooseberries all gave good reports, and the producers found a ready market both for domestic consumption and for canning at fair prices.

On the subject of berry cultivation, D. Edson Smith, who is good authority, presents the following:

"In response to an invitation to present a paper on berry culture, I beg to offer the following, derived, not from theory, but from ten years' actual experience and observation in the Santa Ana Valley. My remarks will be confined to the culture of the strawberry, the blackberry, and the raspberry. Any land that will raise good corn is adapted to these berries, and one is not liable to make the ground too rich. Deep stirring and thorough pulverization of the soil before planting are essential to success. I deeply plow, and harrow my ground several times before planting, to facilitate irrigation, for all these berries need a large amount of irrigation.

"I prefer slightly ridging the rows for strawberry plants, and putting them far enough apart to admit of using a narrow horse cultivator between them, and place the plants from eight to twelve inches apart in the row. The ground allotted to strawberries should be divided into three parts, and one of these parts should be plowed up and reset every year. After the setting of the plants the success depends on thorough culture, freedom from weeds and runners, and proper irrigation. The strawberry feeds near the surface, hence the surface soil must be kept moist enough in some way to allow the feeding rootlets to take up the plant food from the soil. A mulching of straw will aid greatly in preventing evaporation. We have several good varieties of strawberries to select from. For an all-around berry I prefer the Monarch of the West, but let each one test the different varieties in his own neighborhood and then choose that which pleases him best.

"Prepare the ground for blackberries and raspberries the same as for strawberries, leaving it level. Make the rows from eight to ten feet apart, according to the richness of the soil, and put the plants four feet apart in the row. A new field should be planted every third year. While these berries do not feed so close to the surface as the strawberry, still they require a great deal of water, and proper provision should be made for it. February and March are good months in which to set out these berries. When the plant has grown to a height of three feet, I cut off the tip with a pruning-hook. This will cause the plant to throw out laterals; and when these attain a growth of eighteen inches, I clip their ends in the same way. I continue this clipping process throughout the growing season as often as the vigor of the plant demands, and through each year until the plant is dug out. After the plants come into bearing, the bearing canes must be cut out after each season's fruiting. Keep the space between the rows thoroughly cultivated and moist, and free from weeds and sprouts all the time. I use a knife cultivator and spading harrow. The soil in the rows, between and immediately around the plants, will have to be worked with a hoe. A few shovelfuls of manure thrown around the roots of each plant in the fall will be of great benefit. This is all there is to it—irrigation, cultivation, pruning, and feeding. As to varieties, I have settled down to the New Rochelle for a raspberry, and Crandall Everbearing for a blackberry.

"The Blackcap raspberry does not seem to thrive in a paying manner in Southern California, excepting in a few localities. Let each one try them, in a small way, and if they prove successful then enlarge the plant; for there is quite a demand for that variety of berry. The Cuthbert is the best of the red varieties that I have seen raised, but many

of us are ceasing to propagate it because of its tendency to winter-kill from some, to me, unknown cause. Still, in some localities, it proves to be very profitable. There will always be a good demand for this berry, and those who have the proper conditions should cultivate it.

"But the preëminently best raspberry for the market is the New Rochelle, a cross between the Doolittle Blackcap and the Cuthbert Red. The berry, when fully ripe, is of a purple color. It is of quite firm texture, making it a good shipping berry. Its quality is much inferior to the Cuthbert, but as it comes into the market when all fruits are scarce, and is almost gone when the Cuthbert ripens, it is eagerly sought after. It is a prolific bearer, vigorous grower, and entirely hardy and free from disease as far as I know. I plant no other kind for a market berry.

"Of the many varieties of blackberries the Kittatinny and Lawton were favorites with me for many years, but I do not intend planting any more of them, because the Crandall's Early, or Everbearing, is so much superior in every respect. It is entirely healthy, vigorous, and prolific. The fruit begins ripening early in June, and we are still (November 10th) enjoying an occasional dish of them for supper. They are free from core and of fine flavor; in fact, with me, they are 'the' berry.

"The marketing of our berries is an important item. We are now able to obtain well-ventilated boxes of various sizes very cheaply. Great improvements have also been made in the carrying crates, the best of which, so far as I have seen, is the Hall crate, made at Monrovia. It has folding partitions, and, while thoroughly ventilated, the fruit is protected from all insects and largely from all dust.

"Berries should reach the consumer the same day they are picked, in order to be in the best condition. This requires the pickers to get to work as soon as it is light enough to distinguish the ripe berries from the green. A berry should be fully ripe when picked. Care should be taken by the pickers to exclude from their boxes not only all unripe fruit, but also all defective berries and all leaves and stems that will detract from the appearance of the package. The filled crates should be taken to the market or depot in a spring wagon, in time to reach the consumer at the earliest possible moment.

"As to the profits of berry culture, it depends entirely on the location and the harmonious coöperation of the producers. If your rail and water facilities are all right, and you are located near a large town, then the profits will be satisfactory if all the growers in that vicinity will combine to hold the price at a fixed amount. But if you cannot do this there will always be the liability of some with a large crop and great need of present money sacrificing their crop for less than the labor was worth that produced it, and thus forcing all to sell at the same sacrifice. While this would temporarily be of benefit to the consumer, it might be suicidal to the producer, and so I would advise every one to carefully weigh the chances and thoroughly examine all the contingencies before investing all his capital in berry culture."

CHAPTER IV.

THE DRIED FRUIT MARKET.

The returns from dried fruits for the year 1891 have not been so large as were those of the preceding year. That they should be was hardly to be expected. In 1890 a combination of circumstances rendered the demand for our California dried fruit phenomenal. There was an almost total failure of the Eastern fruit crop, coming at a time when the supply of preserved fruit was exhausted; at the same time the California crop was not extra large, and the result was keen competition among the jobbers, and an advance in prices that was remarkable. California was called upon to supply the requirements of the entire United States. Such a demand was unprecedented, and, while it was of great benefit to those fruit growers who were in a position to take advantage of it, the return of such conditions cannot be looked for frequently, nor can an extraordinary season be used as a basis upon which to build our hopes for the future. Speculation in fruit aided in sending up prices, and it was thought early in the season that but little dried fruit of 1890 curing would be obtainable. This was especially the case with peaches, plums pitted, and apricots, although values in the entire line reached a high plane. The season's output, however, was much greater than was anticipated, and speculators and dealers incurred heavy losses, especially on late holdings. The result of this was to shake the confidence of speculators in dried fruits, and in 1891 very cautious purchases were made, and at lower prices than in the preceding year.

Prunes were the favorite in the market this season. The yield was much larger than ever before, the acreage having been very greatly increased in the past few years, and a very large area of new trees having come into bearing. The great bulk of this crop came from Santa Clara Valley, although Sonoma, Solano, and other northern counties contributed a very large quota to the total output.

The graded stock is now all marketed, and it would be difficult at this date to get orders filled for carload lots of the four sizes. Most of the prunes now remaining unplaced are 90-100s and smaller, with no evidence of there being any large amount of this class of stock still awaiting a market. The range of prices, exclusive of extra large sizes and fancy qualities, or very small and inferior stock, has been in wholesale circles from $4\frac{1}{2}$ to $6\frac{1}{2}$ cents in sacks, as to size and other conditions, with most of the business within 5 to 6 cents. The four sizes have sold mostly at $5\frac{1}{2}$ to $5\frac{3}{4}$ cents, but have been quoted lately at $5\frac{3}{4}$ to 6 cents, with the market tolerably firm under slim offerings, and prospects more favorable for values to harden than to recede as the season advances. Boxed prunes commanded only about half a cent advance over stock in sacks, the preference being given to sacks by nearly all large buyers.

Peaches of other than selected quality have dragged most of the season at generally low and irregular prices, and the more ordinary descrip-

tions do not give promise of cleaning up speedily at the low figures now ruling. Comparatively few peeled peaches came on the market from last crop, neither was there any decidedly active inquiry for this style. Peeled and bleached found moderate custom within range of 9 to 13 cents, but for peeled unbleached there were few buyers, values for this description being nominal, most of the time at 6 to 8 cents. Peaches unpeeled ranged from $3\frac{1}{2}$ to $7\frac{1}{2}$ cents for bleached from first hands, and 2 to $3\frac{1}{2}$ cents for ordinary sun-dried, although sales as low as 2 cents were the exception, and mainly of undesirable quality, accompanied with decided selling pressure. Bleached peaches, of first quality, obtainable at 6 to 7 cents, were sought after early in the season, and most of this class of stock had passed into the hands of jobbers as early as November. The bleached unpeeled dragged at $3\frac{1}{2}$ to 6 cents, and common sun-dried were sought after at $2\frac{1}{2}$ cents.

Plums were not cured as extensively, perhaps, as in some former seasons, but there were enough to accommodate the demand, and at the same time keep prices at very much lower levels than in 1890. Pitted stock constituted the bulk of offerings, and was the kind most salable. The market for pitted plums opened this season at $5\frac{1}{2}$ to $6\frac{1}{2}$ cents, with a few early sales at a little higher range. Prices were soon on a decline, however, with $5\frac{1}{2}$ cents a full wholesale figure during the greater part of September and October, and later on $4\frac{1}{2}$ to 5 cents was about all that was justified as a wholesale quotation.

Apples were turned out in fair quantity, but the quality of a large portion of the product was not all that could be desired, and considerable was decidedly inferior, especially sliced and evaporated, of Chinese packing. Early sales of evaporated, in boxes, were at $7\frac{1}{2}$ to $8\frac{1}{2}$ cents, with sliced, in sacks, $4\frac{1}{2}$ to $5\frac{1}{2}$ cents, and quartered $3\frac{1}{2}$ to $4\frac{1}{2}$ cents. In September prices receded fully half a cent, and in October there was further shading, especially on inferior stock, some poor evaporated, in boxes, going at $4\frac{1}{2}$ cents. During the past two months wholesale trade has been dragging on a basis of 6 to 7 cents for evaporated and sliced, in boxes, and $2\frac{1}{2}$ to $3\frac{1}{2}$ cents for sun-dried, in sacks.

Pears have not been offered freely this season, and there was a fair demand for desirable curings, such commanding moderately good figures. Peeled and sliced evaporated, in boxes, sold mainly within 6 to 8 cents, as to quantity and quality, with sun-dried sliced, in sacks, at $3\frac{1}{2}$ to 5 cents, and quartered $2\frac{1}{2}$ to 4 cents, little of really choice quality being obtainable lately at any figure.

Dried grapes, in common with other fruits, did not fare so well from a producer's standpoint as in 1890. The output the past season was of fair proportions, certainly not less than five thousand tons. Most of the yield has passed into second hands, and, all things considered, at fairly good figures. Efforts were made early in the season to purchase in wholesale fashion at $2\frac{1}{2}$ to $2\frac{3}{4}$ cents, but the attempt was not attended with noteworthy success. September and October business, and the bulk of the wholesale trading was transacted in these two months, was at $2\frac{3}{4}$ to 3 cents. Later on, with less inquiry, and that not very urgent, the market receded fully a quarter of a cent, with the range of values little more than nominal at $2\frac{1}{4}$ to $2\frac{3}{4}$ cents at the close of the year.

PART II.

HISTORY AND IMPORTANCE OF THE PRUNE
INDUSTRY IN CALIFORNIA.

CHAPTER I.

HISTORY OF THE PRUNE.

INTRODUCTION AND GROWTH OF THE INDUSTRY.

The name "prune" is derived from the Latin *prunum*, a plum, and in its generally accepted designation is applied to those special varieties of the plum family that possess exceptional curing qualities, of firm texture, easily dried whole in the sun, or artificially, without fermenting at the pit. These varieties form the prune of commerce, and it is of those that the present paper will treat, although in the matter of soil, climate, methods of cultivation, etc., there is little difference in the propagation of the various members of the plum family, and the treatment adapted to one is usually applicable to all.

According to Theophrastus, the prune was cultivated in Asia Minor in most remote ages. Pliny speaks of its cultivation by the Romans, and makes mention of eleven varieties proceeding from the domestic prune introduced into Italy by Caton, the ancient. It grew without cultivation in the environs of Damascus, and a very rustic and vigorous variety, known as the Black Damascus, is much used by the nurserymen of Europe as subject for grafting all other varieties. The introduction of the prune into France is attributed to the Crusaders. If tradition is correct, this valuable fruit was first cultivated in the southwest of France by the inmates of a convent near Clairac.

In traveling from Aiguillon to Fumel, through the productive valley of the Lot, fertile plains are seen bordering the picturesque riversides, covered with plum trees, which furnish the famous prunes d'Ente and Robe de Sergent, which are exported to the remotest corner of the commercial world.

This valuable tree, which loves a temperate climate, does not confine itself to this special section of France, but is profitably cultivated wherever climatic and soil conditions are favorable to its growth, as is demonstrated by its extensive cultivation in the valley of the Loire, the departments of Garonne, Tarne, Dordogne, and Aveyron. The well known brand called Tours prunes comes from the orchards of the Loire.

INTRODUCTION INTO CALIFORNIA.

It is to France that California is indebted for this healthful and profitable fruit. Louis Pellier, a French sailor, who had visited many parts of the world, arrived in San Francisco in 1849, and went to work in the mines in Trinity County. He did not succeed well there, and finally removed to San José early in the fifties. Here he established a nursery. He soon after induced his brother Pierre, whom he had left in France, to join him in California, and the two brothers worked the nursery together until the spring of 1856, when Pierre returned to France in order to marry a girl to whom he was engaged. Combining business with matrimony, he secured a large number of cuttings of prunes, grapes,

and other fruits, which he brought back with him on his return. His bride and his brother Jean accompanied him, and, together with the box of precious cuttings, they made the voyage successfully, crossing the isthmus, and arriving in San Francisco in December, 1856.

The prune cuttings were procured in the Ville Neuve d'Agen, from whence the common California prune derives its name of Petit Prune d'Agen. They were carefully packed in a box about sixteen inches square by four feet in length, which was lined with cloth, and every precaution was taken to insure the safe arrival of what has since proved the germ of one of the most important industries of California. Upon its arrival the shipment was at once transmitted to Louis Pellier at San José, and a number of plum roots were grafted to the newly arrived prunes. This started the first prune nursery on the Pacific Coast, which was located in the city of San José, on Devine Street, between Tarraine and Santa Teresa.

The importance of Pellier's experiment was not at first appreciated. A German nurseryman named B. Kamp procured some grafts from Pellier, and also worked for the introduction of the prune. He was one of the first to put out prune trees in orchard row. But comparatively little attention was paid to prune growing, as a specialty, for a quarter of a century after its introduction into the State. The superiority of California as a fruit-growing State, however, at last forced itself upon public attention, and, among other fruits, the prune was given a trial, and it soon proved its great capacity as a profitable crop, and to-day it ranks among the leading industries of the Golden State.

GROWTH OF THE INDUSTRY.

Probably the oldest orchard of any size in the State is the Bradley orchard, on Stevens' Creek road, about two miles out of San José. This was set out in 1870. The success of this led others to go into prune growing, and the O'Banion & Kent orchard, near Saratoga, was planted in 1878-9, and the Dr. Handy orchard of one hundred acres, at Saratoga, followed in 1880-81; in 1881 the Buxton orchard, also at Saratoga, was planted, and prune growing and curing on a large scale became a fixed fact.

From that time the growth of the industry has been phenomenal. The prune industry has been practically the growth of the past decade, for within that period the planting of orchards, their cultivation, and the proper care of their product, have grown into a system. In the prune center of Santa Clara County, which ten years since produced not a pound of this fruit, it is now exported by the carload. Above Los Gatos Mr. Morrell was then one of the heaviest producers, and his output was five to six tons per annum; he now packs from five to six carloads each season from the same orchard.

Santa Clara County was from the beginning the center of the prune industry, and here was demonstrated the fact that prune growing would pay; that no extraordinary care was required in cultivation or mysterious skill in preparation. As soon as these facts were demonstrated other counties took up the pursuit, until now the prune is found in all except the highest mountain counties in the State. In 1870 there were but 19,059 prune trees in the State, while the Assessors' reports for 1886, which are probably 25 per cent too low, give the number in the various counties that year at 1,077,841.

The Assessors' reports for 1891 show a very large increase in the past five years in those counties which have made returns.

A large portion of these trees, perhaps one half, are not yet in full bearing. It is estimated that when the trees now growing in Santa Clara County alone shall have matured the annual product will be over forty million pounds of dried fruit.

HABITAT OF THE PRUNE.

The prune is a very hardy tree, and will thrive in a wide range of climate and soil and at various elevations. Wherever the Green Gage plum will grow the prune can be grown. It will stand severe winter weather, and will grow where the thermometer touches zero. Its favorite habitat, however, is a temperate climate and a warm, generous soil. It can be grown in the Eastern States, but the short seasons there, the numerous pests, and the unfavorable conditions for drying which exist, prevent the East from ever entering the field as a competitor to California in the prune industry. Even in California, while the tree will grow in nearly all the counties, there are but few favored localities in which it appears at its best. In some sections of this State where the prune makes a thrifty growth and yields heavily, there is a lack of saccharine matter in the fruit that deprives it of its best qualities, and when dried a very inferior product is the result. In other localities large juicy fruit will be grown, which decreases heavily in drying. The prime requisites in the prune are solid, firm flesh, that will not ferment at the pit in drying, a rich, fruity flavor and bouquet, and a keeping quality that will stand the test of months or years without serious loss from shrinkage, and those sections which possess the peculiarities of soil and climate which insure these in their greatest perfection are the true prune sections. The drying quality of the prune varies very greatly owing to the varieties of soil in which it is grown. In some localities it will shrink in drying from four to one, while in others two and a half pounds of green fruit will make one pound of dried. The fruit will also vary in different places in thickness and toughness of skin.

The prune is a gross feeder, and wants for its best development a rich and heavy soil, with sufficient moisture to feed it. The foothills of Santa Clara County have long been regarded as especially favorable to the prune, but, as experiments in its growth have been made, other sections have been found that furnish all the required conditions, and while Santa Clara is still, and probably always will be, the center and most important section of this industry, it is not now the only prune county of the State. The most extensive single prune orchard in the State is now in the Salinas Valley, in San Luis Obispo County, on the eastern slope of the Coast Range, near the town of Templeton. In this orchard there are nearly three hundred acres of prunes in one body, containing three hundred and twenty-four thousand trees. Some very excellent prunes are produced in Los Angeles, Orange, San Bernardino, San Diego, Ventura, Alameda, Monterey, Napa, Sonoma, and in the counties of the San Joaquin and Sacramento Valleys, while especially good results have been reported from Tehama, Shasta, Humboldt, Sutter, and Yuba Counties. It is not improbable that in time the different localities of the State will discover certain lines in which each excels, and the production of specialties in that line will result, the fruit from each being known for its own peculiarities.

CHAPTER II.

METHODS OF CULTIVATION.

SOIL AND STOCK.

The soil required for prunes depends largely upon the stock used, or rather, perhaps, the stock should be selected to suit the soil. A light, deep, sandy loam, not too moist, and well drained, is adapted to peach stock, which does well on the sedimentary deposits of the higher valleys. Such soils are warm and light, and experience has proved that peach stock will do better here than on the heavier, clayey lands of the bottoms.

In the heavier soils plum stock does better than peach, and the Myrobalan, or wild plum stock, is the favorite. It is hardy, forms a good union with its graft, and does not sucker as other plum stock will.

The almond stock is a favorite with many growers who have a rocky subsoil, as it does well in such land—even better than the peach.

The preparation of the soil depends largely upon its peculiarities. If heavy, it should be deeply plowed and subsoiled. If there is a hardpan subsoil, this should also be broken, which can be done with any good subsoil plow; in any event the ground should be plowed deep and well stirred up for ventilation. It is well, where practicable, to begin the preparation of the land for an orchard some time before the planting of it. It should be thoroughly and deeply plowed early in the fall, leaving the surface rough and exposed to the air during the winter. This facilitates the access of air to the lower layers and gives vitality to the soil. Following in the furrow with a subsoil plow is desirable, especially in the conversion of old grain lands into orchards, as it breaks up the old hardpan which has probably formed through years of shallow culture. The preparation may continue through the following summer, and, where practicable, hoed crops can be grown, or the land can be left to summer-fallow, care being taken to keep it thoroughly pulverized and free from weeds. If it is desirable to fertilize the land, manure can be applied in the winter, before the trees are planted. If this is not done then, the work should be left until the trees are planted, and the manure should be evenly spread over the surface during the winter, to be plowed under in the spring. Care should be taken to spread it evenly and not mass it around the young trees, unless it is to be applied as a mulch to prevent evaporation after spring cultivation.

If it is desired to plant the land immediately after breaking up, the work should be commenced as early in the fall as it is possible to do deep plowing, and the ground should be stirred to a depth of ten or twelve inches or more, if practicable, and should afterwards be thoroughly harrowed. If it is still early, cross-plow deeply and follow with a subsoil plow, working to a depth of fourteen inches or more. Harrow again thoroughly and the land is ready for the trees.

PLANTING THE ORCHARD.

In laying off the orchard it is desirable to have it symmetrical and to economize the land. A little thought and care displayed at the commencement will save much annoyance in after years, and it is no greater task to have the orchard neat in appearance and symmetrical in outline than to have it in a haphazard condition. There are three objects to be considered in laying out the orchard: symmetry of appearance, economy of space, and facility for future care. Of course the first thing is to get the trees in straight rows, at equal distances apart, and every one thinks he can accomplish this. But there are various methods of disposing of the straight row, and these methods all have their advocates, and each one its advantages. The principal forms are the square, the quincunx, and the hexagonal or septuple. The methods most common in use are the square and the quincunx systems. The most generally adopted is the square system, as the orchard can be changed to quincunx after being planted, even after a number of years' growth.

PLANTING SYSTEMS.

In order that the most approved planting systems may be better understood, they are illustrated to show how the orchard is first laid out, and how the trees look after several years of growth.

The Square System.

~~The most approved method.~~ The orchard is laid off in lines

ERRATA.

and a tree planted
Read number of trees in square system 108, instead of 109. feet

Quincunx System.

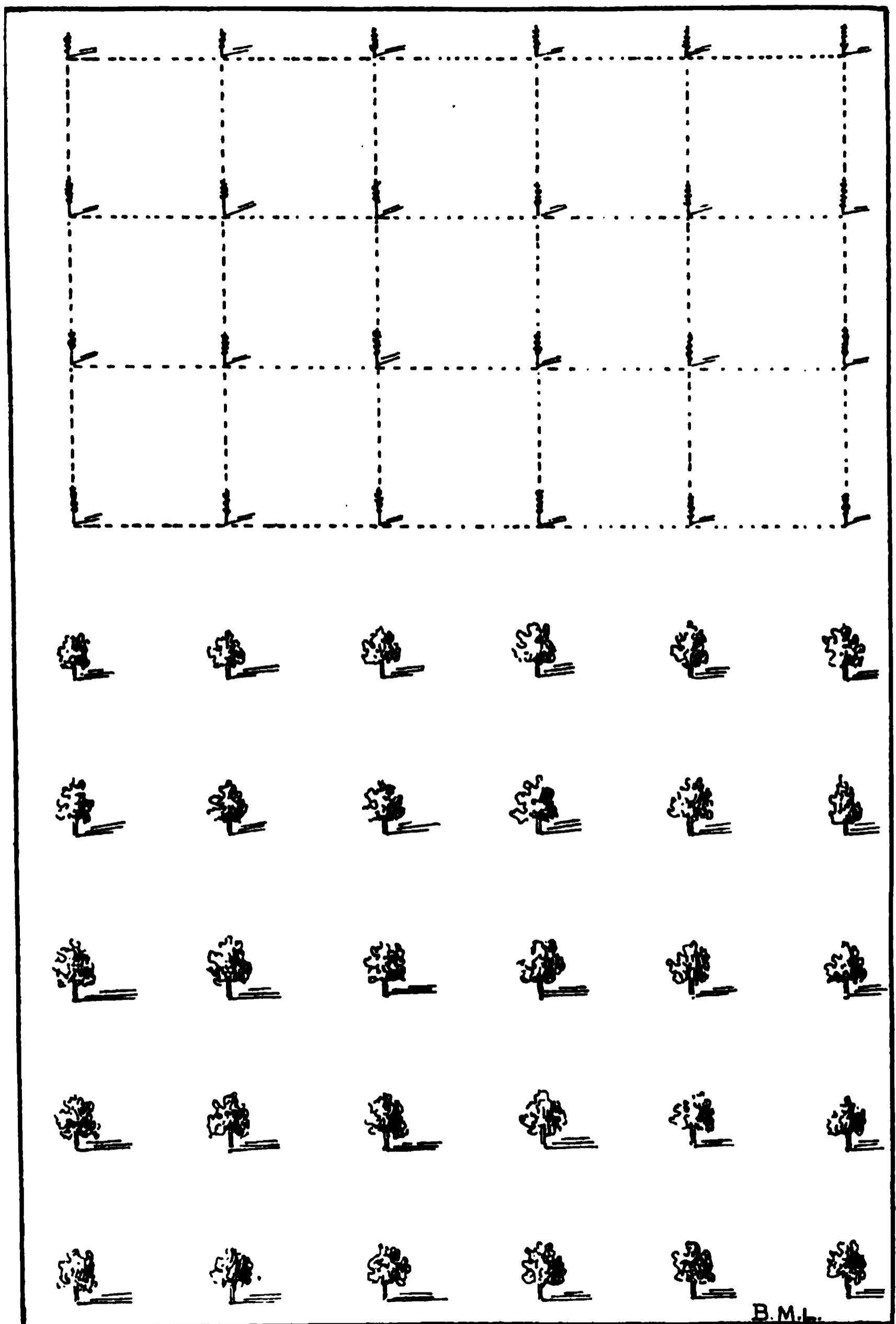
In this system the orchard is laid off in the same manner as for square planting, except that the number of rows are doubled and a tree planted in the center of every square. This method is chiefly used in planting with reference to a future removal of the center trees, which are generally dwarf, when those designed to be permanent shall have attained a considerable size, and the orchard then assumes the square plan. At twenty feet apart, one hundred and ninety-nine trees are planted to an acre by this method.

Hexagonal System.

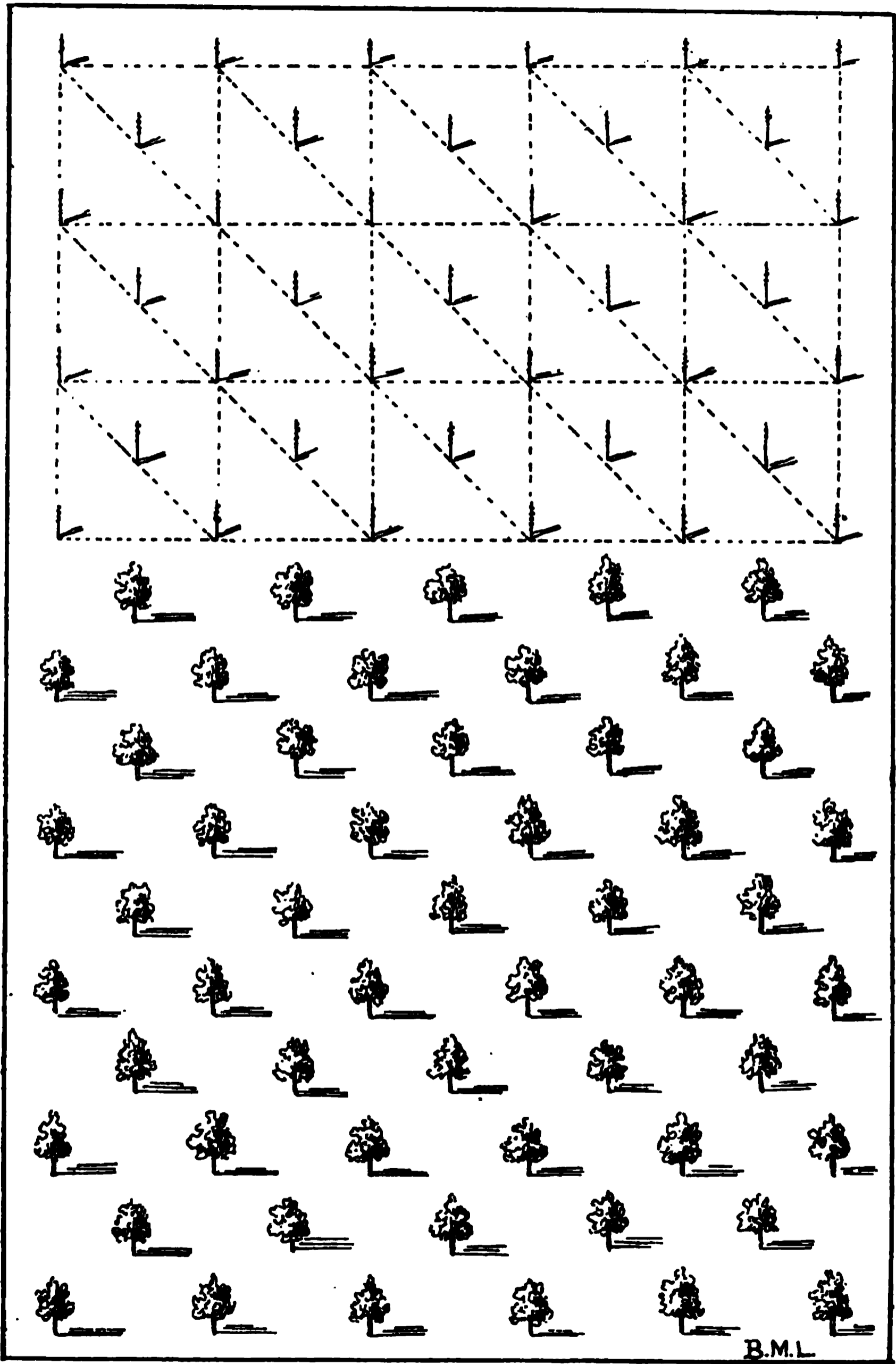
In this system the trees are equilateral—equally distant from each other—and more completely fill the space than any other system can. Six trees form a hexagon and inclose a seventh. The lines in the figure (page 102) indicate the method of laying out the orchard. By this method, at twenty feet apart, one hundred and twenty-six trees are planted to an acre.

Triangular, or Alternate System.

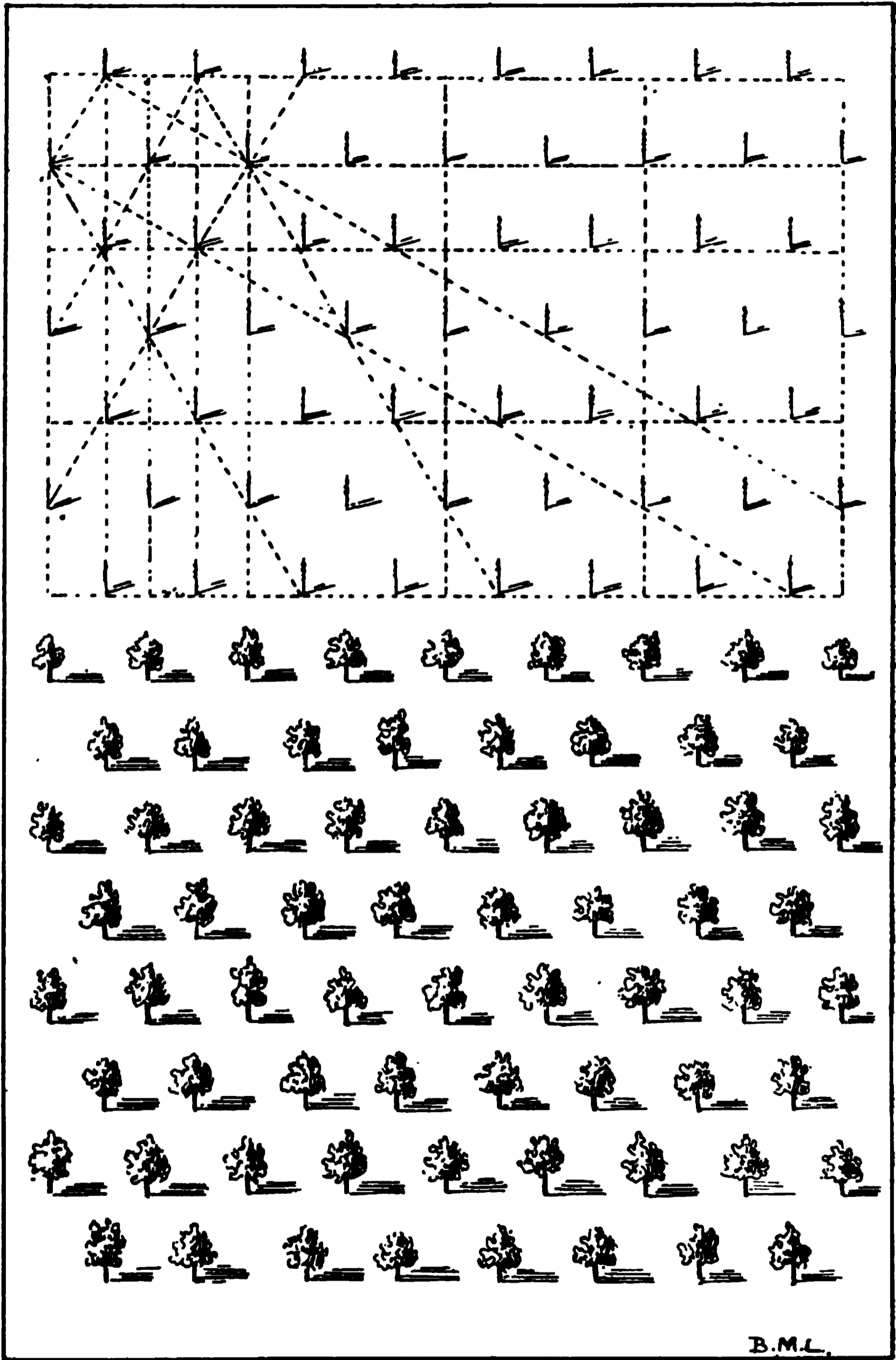
In laying out an orchard by this system, the lines are run forming a square, as in the square system; a line is then run diagonally across, and a tree planted alternately, forming a triangle. The advantage in this system is that the trees are given more space, and can be planted closer together without crowding.



THE SQUARE SYSTEM.

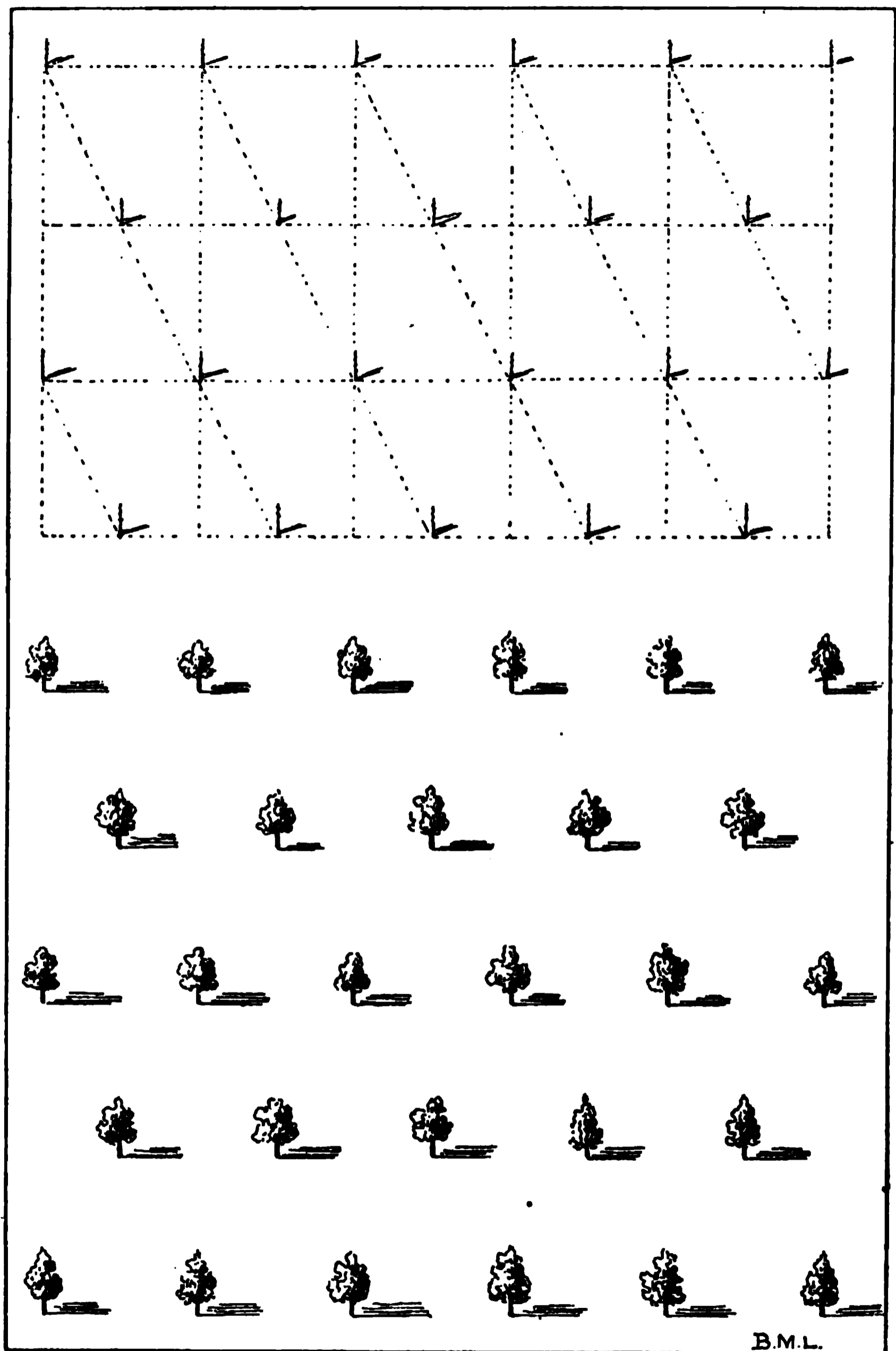


QUINCUNX SYSTEM.



B.M.L.

HEXAGONAL SYSTEM.



TRIANGULAR, OR ALTERNATE SYSTEM.

The following table will show the number of trees to the acre by the square, quincunx, and hexagonal or septuple systems:

	Square.	Hexagonal, or Septuple.	Quincunx.
10 : 12 : 14 : 16 : 18 : 20 : 22 feet : 24 feet : 30 feet :	 48	 56	 88

ERRATA.

Read number of trees in square system 108, at 20 feet apart, instead of 109, also in line 11, (page 104) from below.

NOTE.—In giving the distances of trees of the quincunx, the fifth or central tree is not taken into account.

For any distances not given in the above data, calculate the number of trees to the acre by the square system, and add 15 per cent. This will give the number if planted septuple.

In the proper planting of trees a little admixture of brains is an absolute necessity, as it is in all branches of orchard work. Rules that would apply to one locality and under one set of conditions will fail in another. Some of the most successful orchardists advise the removal of the top dirt carefully, then the digging of a hole of liberal depth and the placing of the surface soil in the bottom; upon this the tree roots are to be set and the hole filled up with top dirt. Where there is a sub-soil of cold, heavy clay this plan is admirable, but in warmer, sandy soils it is unnecessary. One of the most experienced prune growers in Santa Clara County advises the throwing out of a dead furrow after the land has been prepared, in which the trees are to be set at proper distances, and the soil thrown back on them with a plow and afterwards pressed closely around the roots.

The more careful method is the best, as it gives the young tree better root hold, and affords a larger area from which to derive its nourishment during its early period of growth.

The distance at which trees are planted in orchard row varies from eighteen to twenty-four feet, twenty feet being the favorite, and under most conditions probably the best distance. On very strong soil the greater distance would be better, as where more closely planted the limbs of the full-grown trees are liable to become intertwined, and to render cultivation and gathering unhandy. At a distance of twenty feet apart, planted by the square plan, there would be one hundred and nine trees to the acre, and by the hexagonal plan one hundred and twenty-six. After planting the young trees should be cut back to eighteen inches from the ground, and they should be protected during the first season from the heat of the sun by a shade on the south side. Three or four buds should be allowed to grow at the top, and the terminal buds of the lower branches should be pinched back after they have grown out a little, so that the buds will put out leaves and shade the stalk the first year.

VARIETIES.

The principal varieties are the California (the Petite Prune d'Agen), the Bulgarian, the Fellenberg, the German, the Hungarian and the Hungarian Date Prune, the Robe de Sergent, the Silver, and the Tragedy.

Of these the first named is by far the most popular, and forms the true shipping prune of California.

California, or P. d'Agen.

[Plate I.]

Branches of middling strength, bent at their very short internodes, of a deep brown on the shaded side, covered on the sunny side with a metallic whitish pellicle, smooth throughout their whole length. Wood buds small, conical, not very sharp, lying in a direction somewhat diverging from the branch, borne on the salient supports, whose sides extend out to some extent; scales of a deep maroon, the outer ones bordered with whitish gray; shoots flexuous, smooth throughout; leaves hardly of medium size, oval-elliptic, or sometimes obovate, ending abruptly in a short point, concave and often slightly wavy in their outline, bordered with teeth deeply cut and rounded, or rather deeply crenated, well supported on petioles of middling length and of middling strength, wine colored and very slightly downy; two small globular, yellow, pedicellate glands attached to the base of the limb of the leaf. Fruit buds medium size, ovoid, not very sharp, gathered on, rather short and rather thick. Flowers rather large, petals rounded, somewhat incised or emarginated at their extremity, divisions of the calyx short, rather large and spread out, pedicels rather long, strong, and smooth. General hue of the foliage a light green, stiffness of all the leaves, petioles of the leaves well spread out and diverging, are the striking characteristics of the tree. Fruit medium size, exactly ovoid, more tapering on the side of the stock than on the side of the pistillary point, around which it is very obtuse, with the cheeks a little more convex than the faces, one of which is transversed by a scarcely appreciable furrow, and the other by a continuation of the furrow deep enough to make the fruit appear as divided into two equal parts. Skin somewhat thick and firm, parting from the flesh, at first of a light purple, tinged with green; at maturity the purple becomes very dark and covered with a thick and bluish bloom. Pistillary point of a golden yellow, attached very close to the surface of the fruit. Fruit stalk somewhat long, not very strong, of a light green, speckled with brown on the side next the sun, inserted in a narrow and shallow cavity. Flesh yellow, fine, tender, rich in sugar juice, but whose aroma is not fine enough to constitute a toothsome fruit raw, but exceedingly good to dry. Pit small, almost exactly ellipsoid, flattened, emarginated at the end adjoining the stalk, rounded at the opposite extremity, with cheeks not very convex, slightly wrinkled, and most often separating from the flesh. Ventral suture widely but not deeply furrowed, with denticulated edges; dorsal ridge not very salient, only somewhat sharp toward the end attached to the stalk, accompanied with fine but well-marked grooves.

Robe de Sergent.

This prune has been classed under various types of prunes grown in several districts of France. Fruit medium size, oval; skin deep purple, approaching to black, and covered with a thick blue bloom; flesh greenish yellow, sweet, and well-flavored, sugary, rich, and delicious, slightly adhering to the stone; a valuable drying and preserving variety. The tree is quite an upright grower, and has a much broader leaf than the Prune d'Agen. A peculiarity of this prune is that it cannot be worked

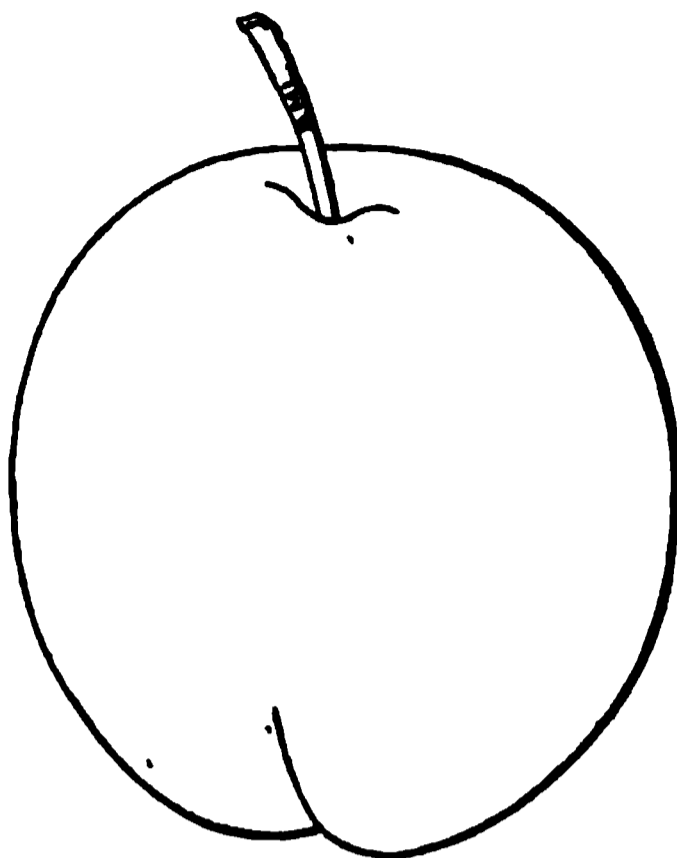


Fig. 1.

on any other but plum stock, except by double working. When budded on peach and almond it sooner or later severs from the stock. The striking characteristics of this tree are bright, shining, large leaves, lancet-shaped, growth strong, not tapering, violet brown underneath, with silvery skin pieces.

Silver.

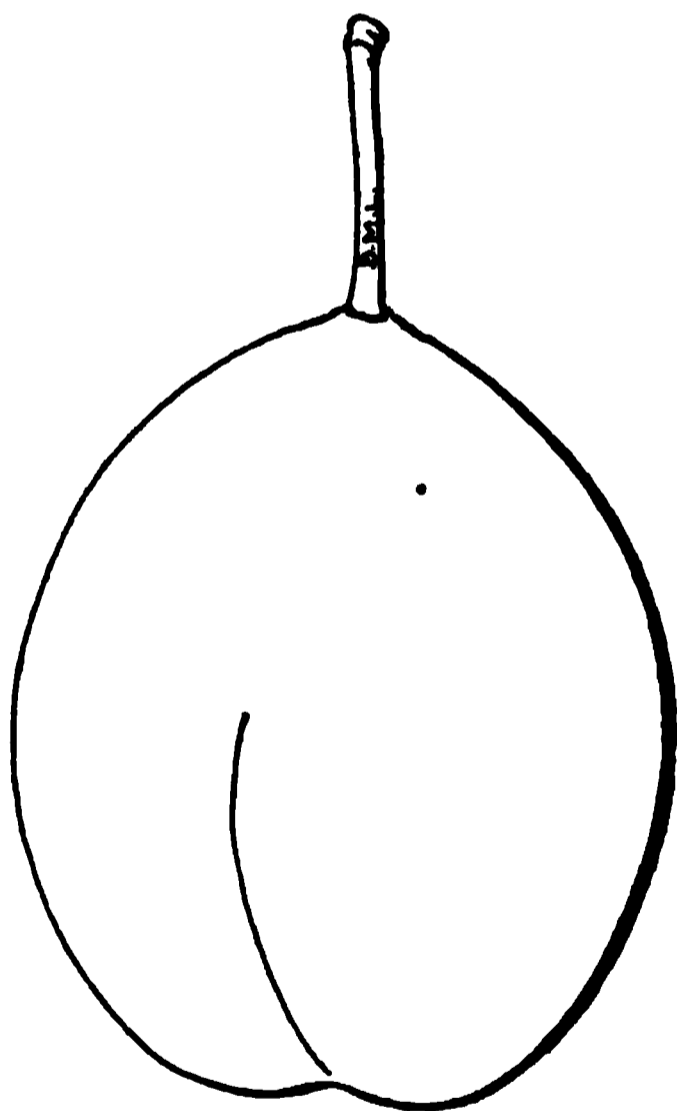


Fig. 2.

Originated in Oregon; it is said to be a seedling of Coe's Golden Drop, which it much resembles. In the judgment of fruit experts, it is entitled to rank with the best drying plums and prunes, because of its large size, handsome appearance, and superior flavor.

Fruit large, oval; a little necked, with one side a little more swollen than the other. Skin light yellow, marked with numerous dark red

spots on the surface side. Flesh yellow, firm, adhering to the stone; sweet and rich flavor. Tree a rapid grower, but does not bear as young as other varieties.

Bulgarian.

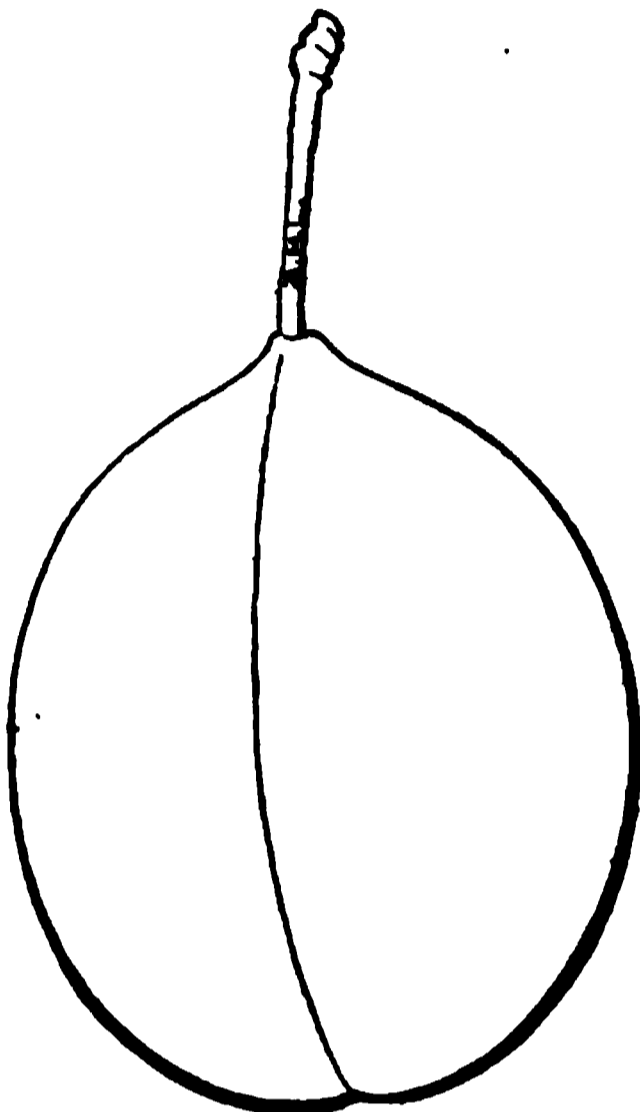


Fig. 3.

A variety cultivated in Alameda County, chiefly in the vicinity of Haywards. Fruit above medium size, dark purple, sweet and rich, with a pleasant acid flavor. Tree a vigorous grower, and an early, regular, and profuse bearer. The fruit is very tenacious, does not drop when mature; valuable for drying.

Brignole.

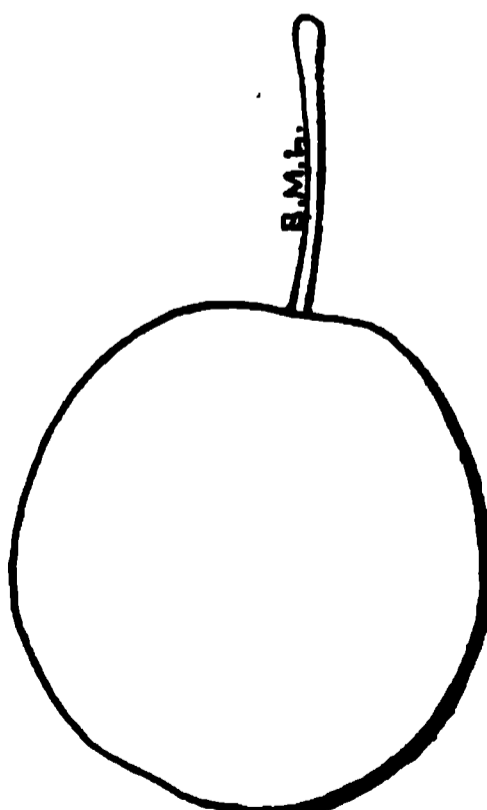


Fig. 4.

Fruit medium oblong; the skin is tough, tasteless, easily removed; color violet, with golden spots on the sunny side; covered with a whitish silver bloom, and spotted all over with light yellow dots; sometimes it

is covered with marks and liver-spots. The meat is greenish yellow, varying to light yellow, tender, and finely grained, very juicy and sweet. The tree is a vigorous grower, and wants warm climate. The big limbs at the upper ends are very crooked; violet-brown color, underside greenish. The leaves are large, egg-shaped. A freestone.

Fellenberg.

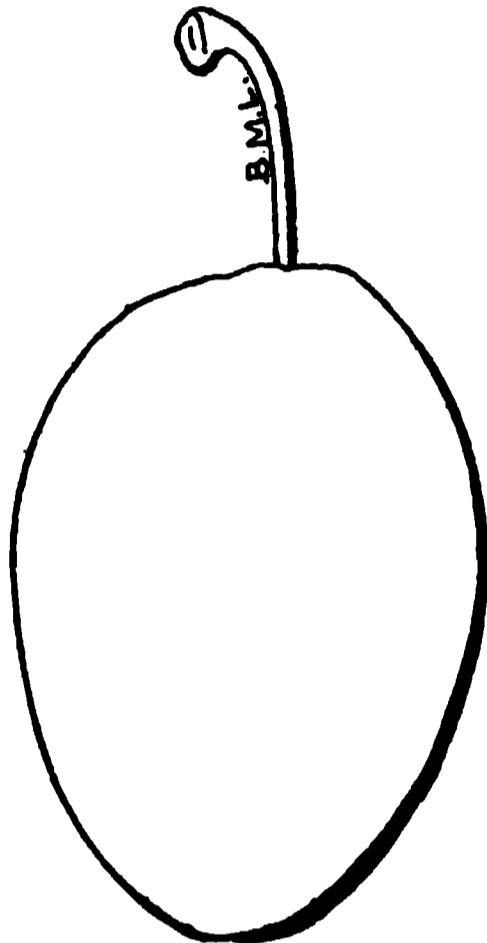


Fig. 5.

Oval, narrower towards the stem. The skin is thick and easily removed; color violet-brown, sometimes violet-blue. Little gray dots are very numerous. The bloom is light blue. The meat is of a beautiful yellow color, consistent. A freestone; very juicy, with a very agreeable sweet and slightly acid taste.

Wangenheim.

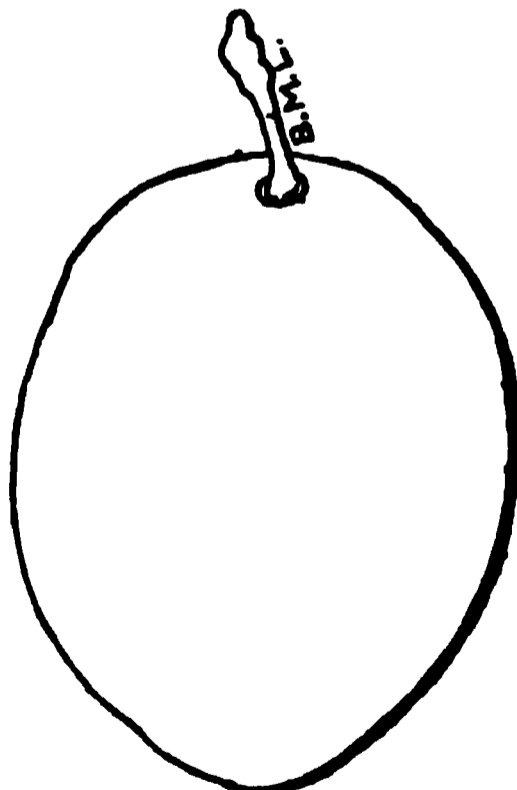


Fig. 6.

Fruit medium size, oval. Skin deep purple, covered with a thick, blue bloom. Flesh rather firm, greenish yellow, juicy, sugary, rich, separates from the stone. Ripens in August.

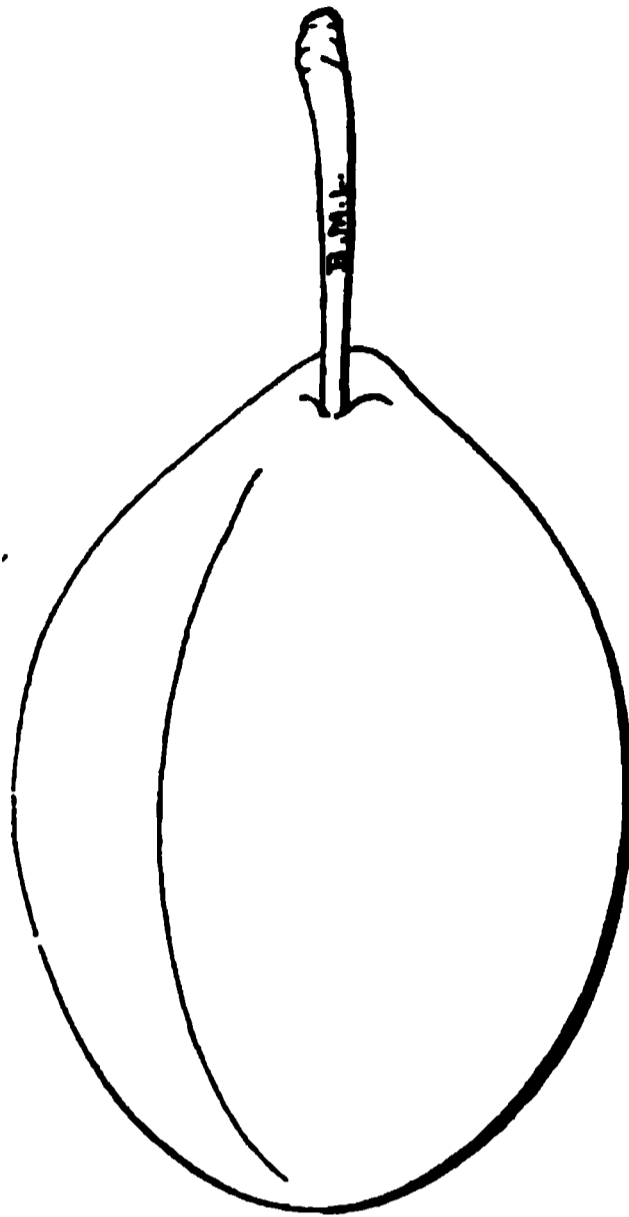
Hungarian.

Fig. 7.

Very large, dark red, ovate, tapering towards the stock, inclined to double; juicy and sweet. Its large size, bright color, productiveness, and shipping qualities render it a profitable variety for home or distant markets. Tree a rapid grower and profuse bearer.

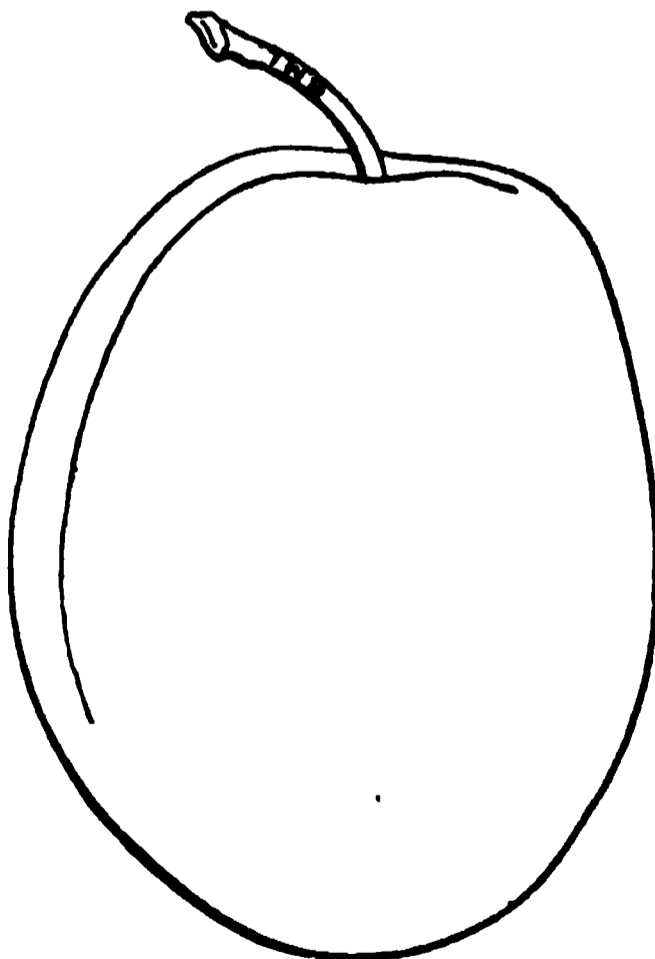
Tragedy.

Fig. 8.

A new prune originated by O. R. Runyon, near Courtland, in Sacramento County. Seems to be a cross between the German and Purple

Duane. Fruit quite large—nearly as large as the Purple Duane, looks much like it, only it is more elongated; skin dark purple; flesh yellowish green, very rich and sweet, being sweet from the time it commences to color; frees readily from the pit. Its early ripening (in June) makes it very valuable as a shipping fruit. One of the great points in favor of this prune is that the tree is scale-proof, being, in this respect, similar to the Black Tartarian cherry. The tree is a rapid grower and of beautiful form.

St. Martin.

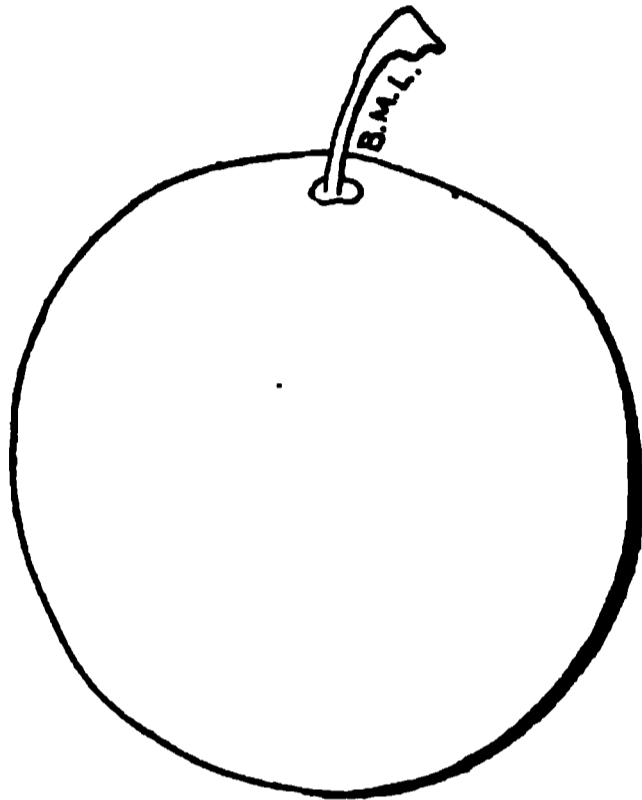


Fig. 9.

A late variety, hardy, and a good bearer; very blunt at the stem end. The skin is thick, tasteless, and can be drawn from the flesh; color yellow, varying to greenish, dotted with red spots. The meat is golden yellow, very sweet, and very agreeable to the taste. A clingstone.

German.

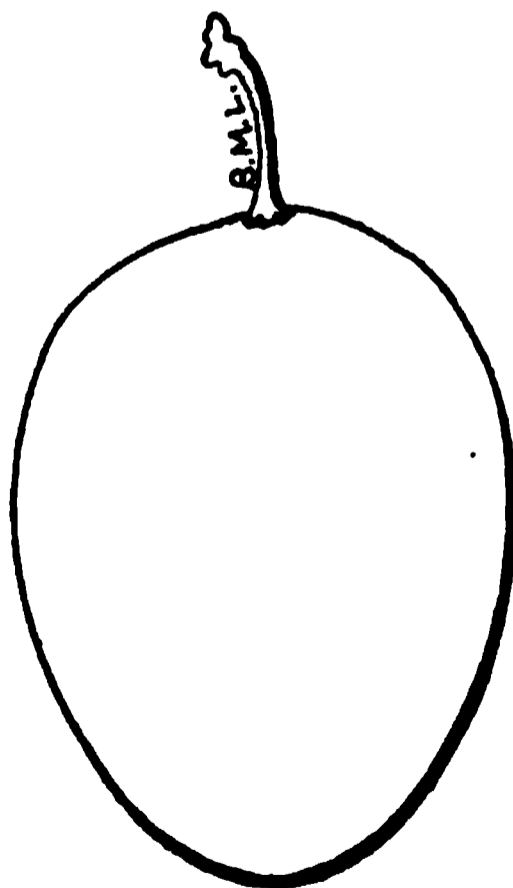


Fig. 10.

Fruit long, oval, and swollen on one side, a little narrower at the point. Skin fine, easily removed, turns dark brown on the sunny side.

Bloom is light blue. The meat is greenish yellow, tender, quite sweet, losing its sweetness through an agreeable acid taste. Separates readily from the stone.

Hungarian Date.

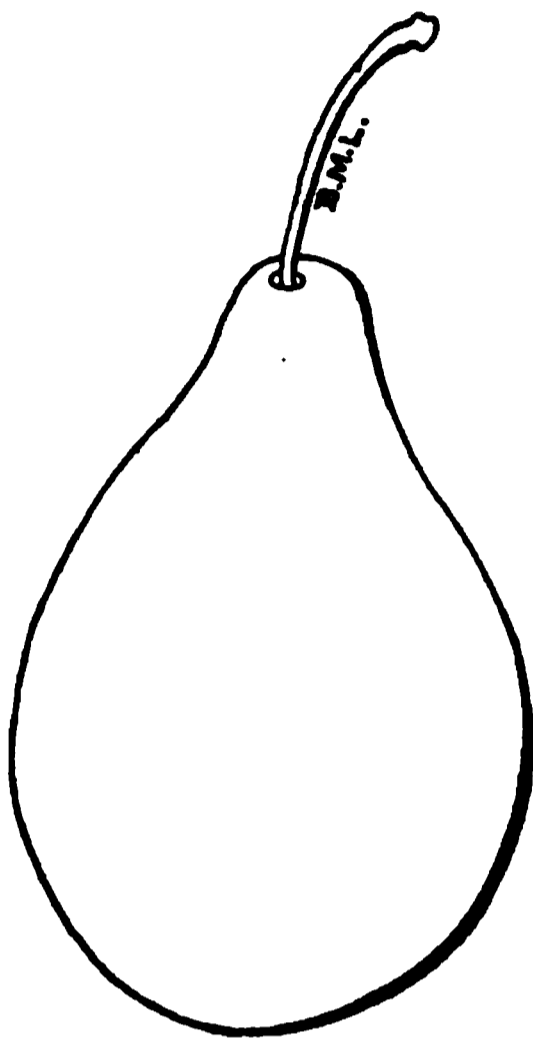


Fig. 11.

The fruit is large, long, rounding, at the stem very narrow. The fruit is thicker than wide; thickest in the middle. Skin is thick and tough, tasteless, and is easily removed; color dark violet-blue, with a reddish shine. On the sunny side there are many red dots and liver-spots. The meat is greenish yellow, coarse, shining, and of a juicy, sweet-wine taste. A freestone.

St. Catherine.

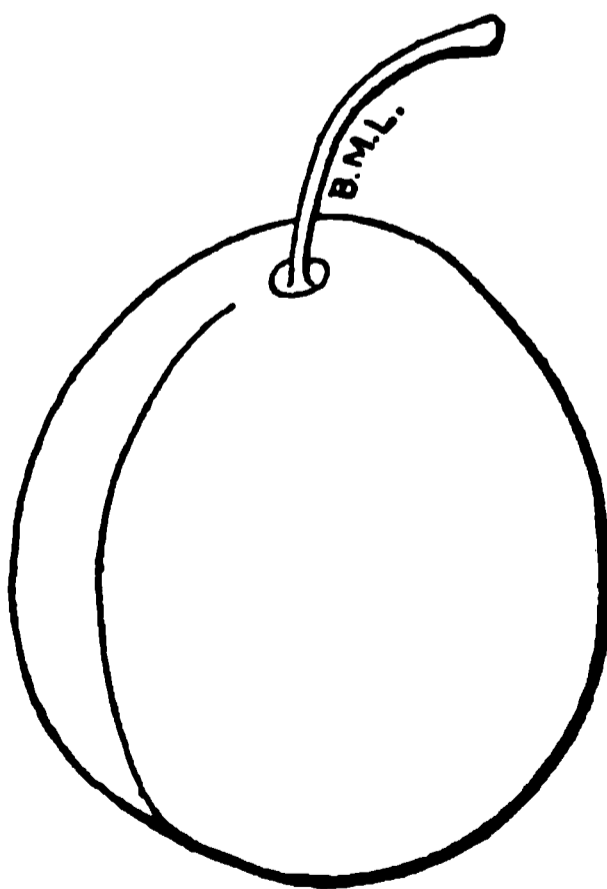


Fig. 12.

Medium size, narrowing considerably towards the stalk. Skin very pale yellow, overspread with thin white bloom. Flesh yellow, juicy,

rather firm, and adheres partially to the stone; flavor sprightly, rich, and perfumed.

Golden.

Originated from seed of the Italian prune, somewhat larger than its parent, of light golden color, exquisite flavor, and good for drying. It is easily peeled and separates readily from the stone, which is quite small for the size of the fruit. The tree is a good grower, an abundant bearer, with heavy dark green foliage.

PROPAGATION OF THE PRUNE.

The first prunes were grafted on plum stock, but this has grown into disfavor on account of the tendency of plums to throw out suckers; and other stocks, the peach, the apricot, and lastly the Myrobalan plum, have come into use.

There is an intimate relation between soil and stock. For light sandy soil the peach stock is yet in great favor, and many growers prefer it over all others. Upon heavier soils it does not do so well as does the Myrobalan. For some time apricot stock was the favorite, but it has now fallen into total disuse. Experience has taught fruit growers a severe lesson. The prune makes a very poor union with the apricot, and when the tree gets to be large enough to catch the wind it invariably breaks off at the joint of the two stocks. In one instance a fruit grower lost one thousand trees in an orchard.

Those who have prunes grafted on apricot root can prevent their loss in the following manner. As the peach makes a good union with both the prune and the apricot, it can be used as an aid: The soil must be removed from the tree so as to get at the union of it. The peach cion must be cut in such a way as to be inserted above and below the union. It will form an arch with the trunk of the tree. On small trees two such grafts will suffice, but on large trees at least four should be placed. These grafts will eventually thicken and form a complete trunk for the tree.

The Myrobalan, or cherry plum (*Prunus myrobalana*), has of late come into great favor as a stock for the prune. It is claimed by some growers that the fruit on Myrobalan stock is smaller than on peach stock, but that its flesh is more solid and dries heavier. The influence of the root on the cured fruit is, however, still a mooted question.

The Myrobalan stock comes from France. It is a wild plum of great thriftiness, and is used very extensively in that country for budding stock of the prune. It grows readily from seed and cuttings, and is easily propagated. The seeds are generally sent to this coast in the middle of October, and then they are at once sprouted. There has been considerable discussion during the last few years as to what is the true Myrobalan, and it must be acknowledged that some of the refined distinctions which have been mooted do not seem to be well placed. Seedlings grown from the seed of the Myrobalan vary, as do other fruit seedlings, both in fruit and in foliage and habit of trees; and perhaps this fact has given rise to the distinction between "true" and "false" Myrobalan, so called. Practice has proceeded without much reference to the discussion, and whether grown here from seed of trees imported long ago, or from cuttings of the same, or whether seedling stocks are



Fig. 13.

Myrobalan plum tree. A. The flower. B. The fruit.

imported directly from France, as large quantities are, the Myrobalan of French origin is now the accepted plum stock for California. It has largely displaced the St. Julien and the Mirabelle, as well as the peach. Though described by some authorities as a dwarfing stock, it is found to be sufficiently free growing in California to suit all purposes, and to form a good foundation for full standard trees. Such prominence has been attained by the stock that we introduce an engraving of the typical Myrobalan tree. Its leaves are smaller and its shoots finer than the cherry plum tree, grown for its fruit in this State.

Whether Myrobalan shall be grown from seed or from cuttings is an open question in California practice. Large quantities have been grown from cuttings, as is the French practice, according to Baltet. Other propagators hold, with W. H. Pepper, of Petaluma, that plum cuttings form a mass of fibrous roots at the lower end of the cutting, and when transplanted fail to send out strong supporting roots. As for the durability of trees grown from cuttings, there can easily be found old, thrifty orchards planted with such trees, though it must be acknowledged a better root system would be expected from a seedling, and there are instances in which trees from cuttings are held to be diseased in the root, while seedling roots are healthy. Possibly longer experience may yield a demonstration of the question.

Experience has shown that the Myrobalan stock thrives in this State both in low, moist, valley lands, in comparatively dry lands, and in stiff upland soils. Thus it has come to be accepted as an all-around stock for the prune.

It is urged against peach stock for damp, heavy soils, that it does not do well; that the sap sours and the fruit will not set well, while the root is subject to root knot, borers, and other pests that do not affect the Myrobalan stock on the heavier soils.

The prune is propagated by both budding and grafting. It is customary to bud the young stock first, as, if the bud does not take, it affords an opportunity to graft later in the season, thus giving the nur-

seryman two chances. The budding season extends from the middle of July to the end of August. The young trees are stripped of their leaves and twigs about six inches above the ground, at which place the bud is inserted. The grafting season is in January and February, at which time grafts are inserted in all the plants in which the buds have not taken. The grafting is done as near the surface of the soil as convenient, usually about two or three inches from the ground. The whole process of budding and grafting is described at length elsewhere in the present report, under the caption of "Propagation," and can be dismissed here without further notice.

CULTIVATION.

In the prune orchard, as in all others, careful cultivation pays. A double object is attained by keeping the surface well pulverized. First, the weeds, which draw heavily upon the vitality of the soil, which should be devoted to tree and fruit growth, are destroyed, and the fertilizing qualities which they would extract from the land are left for the benefit of the growing fruit. Second, it prevents the rapid evaporation of the moisture of the soil, the loose surface acting as a mulch, and on dry lands especially renders the need of irrigation less frequent. Further advantages are found in the neat appearance of the orchard, making it pleasing to the eye, and further, rendering its penetration easy both to teams and men. A neglected orchard, overrun with weeds, takes money out of the pocket of the owner.

It is customary to plow deeply in the early spring, usually as soon as the weeds are fairly started. The seeds of these are given a fair chance to germinate, in order that the plow may turn under and destroy as many as possible, rendering subsequent cultivation much easier. Near the tree rows, shallow plowing must be the rule, taking care to avoid injuring the roots as much as possible. After plowing, the land should be thoroughly harrowed and left in as good condition as it can be made. After the spring plowing a cultivator, or weed cutter, should be run through the orchard from two to four times in the season as may be needed, to keep the weeds down and the surface loose. Particular pains should be taken in the last cultivation to leave the ground beneath the trees as fine and smooth as it can be made. Many growers work it fine with a rake, breaking carefully all lumps, smoothing down all hillocks or inequalities, and leaving a perfectly level and soft surface, upon which the ripened fruit can fall without injury. In foothill land it is usual after the harvest to plow a furrow on the low side of the row, which is left during the winter to catch the rainfall and prevent its escape to the lower lands. By this means the land gets the benefit of the entire winter precipitation, which is husbanded for summer use.

IRRIGATION.

The matter of irrigation is another thing that must be left to the individual orchardist, for it depends wholly upon the character of the soil upon which the orchard is growing. Some lands producing excellent prunes are so damp that drainage has to be resorted to in order to prevent the surplus water from drowning out the trees, while upon others, notably in the southern part of the State, where intense evaporation and dry land are the rule, irrigation must be frequent and thorough,

and careful cultivation must follow each period of irrigation. In portions of the Santa Clara Valley, it is believed that at least twenty inches of rain are necessary to insure good crops, and winter irrigation is resorted to, the land being thoroughly soaked while the trees are in their dormant state, and no water is applied in the summer. Upon this question there is as great diversity of opinion as there is in regard to soil, and each grower must use his own best judgment, taking into consideration the characteristics of the land upon which his orchard is situated. In sections where irrigation is practiced for all orchard crops, the prune is treated the same as is the peach, the apricot, or the almond.

PRUNING.

The training of the young tree requires thought, care, and judgment. In the first three years of its life it is to assume the form which it is to retain during its whole existence. Here again, the individual judgment must be exercised, and conditions of soil, climate, and requirements must be considered. Two schools in regard to pruning have sprung up, each advocating a system diametrically opposed to the other, and each backing its opinions with plausible arguments—the one favoring high pruning, the other low; one heavy pruning, the other light. It is argued in favor of the high-cut tree that it is much easier to cultivate the orchard when a horse can be driven under the limbs, than when it is necessary to work under them with a hoe, as when they are trained low. The advocates of high pruning, in answer to the objections that high pruned trees in hot climates are liable to sun-burn, state that they may be planted closer together and thus afford shade for each other. In favor of low pruning, it is urged that the limbs bending beneath their weight of fruit will find support on the ground, that the trunks are protected from the sun, and that the fruit is easier to gather.

W. H. Aiken, of Wrights, gives the following rules for training the young tree:

“Cut back the trees after planting to eighteen inches from the ground, and shade on south side by some convenient shade. Three or four buds should be allowed to grow at the top, and the terminal buds of those below pinched back after they have grown out a little, so that the buds will put out leaves and shade the stalk the first year. The second year remove them and cut back the limbs to a foot in length; the third, two feet, etc., the object in view being to shape a handsome tree with strength and bearing space, which can be attained only by low training and intelligent pruning.

“After about six years of age, when in full bearing, the tree does not need cutting back as much as it does thinning out of cross limbs, if any, and pruning out unfruitful wood. The sprags or small twigs in body of the French prune tree should be cut back to one or two fruit buds, so that the fruit may be large. Some, however, advise the removal of all such sprags, as the fruit on them is small at the best.

“It is important in pruning to select buds on the upper side of limbs, as they will have a greater weight-bearing power than buds forming branches from under side of boughs. Summer pruning is not advisable. A full season's growth properly pruned back in the winter, and trained low so that the branches take a natural upward and oblique direction,

will shape a tree that will be strong and broad enough to live long and be fruitful.

"My idea of pruning the prune tree is to make a handsome tree with plenty of limbs, and prune it back so that it will give the limbs great strength and bearing space. In that way you can raise a large amount of good plums or prunes. The tree should not be thinned out much unless the limbs cross, because when they begin to bear the tree opens very nicely. I have eight-year old French prune trees, and, though they didn't average it, many of them had eight hundred pounds of French prunes on this year, without much affecting the form or shape of the tree. They were so pruned and so strong, and with such a broad bearing space, that they bore that amount of prunes and very easily, although it has been a dry year, and they were not quite as large as they would have been if there had been a little more moisture. I think the great mistake in raising the prune is leaving too few limbs, say one limb up in the air, and the other one in another direction, like two arms. On such a tree you can raise very little fruit, and it would be of very little profit. I am of the opinion, too, that this pruning should go on each year and give a fine form and strength and bearing space, and when the tree bears and gets to be over six years old, and is in good bearing, you don't need so much pruning back. Indeed, I think when the tree is eight, or nine, or ten years old, it does not need much, if any, pruning back; of course, take out the old limbs to keep it in good form or shape."

Low training and little pruning after the fourth year have grown in favor of late, and are the systems which have the largest support among prune growers. The work of pruning should be commenced as soon as the sap stops flowing, which will depend upon the season, but as soon as the green leaves are gone, and no danger is to be apprehended from "bleeding," pruning may be advantageously begun.

PESTS AFFECTING THE PRUNE, AND THEIR REMEDIES.

Plum Aphis (*Aphis prunifolia*).—These plant lice appear on the under side of the young leaves in spring, and increase very rapidly, so as to cover the new growth in a few weeks. In the last few years this pest has been on the increase. Plant lice, as a general rule, are hard to destroy, owing to their oily excrement. So far whale-oil soap has proved the best remedy. If a tree is badly infested the lice produce such quantities of honey-dew as to make the leaves and fruit very sticky to handle.

Peach Moth (*Anarsia lineatella*).—This insect attacks the young shoots of the tree, bores into the pith, and causes the shoot to wither. Last year it proved very destructive, and caused many a fruit grower to become alarmed. The lime, salt, and sulphur remedy applied in winter checks it to a great extent.

Tree Cricket (*Oecanthus latipennis*).—The limbs of the prune are bored into by this insect, and the eggs are found in the pith. When these crickets are numerous the young limbs become seriously damaged. The best remedy is to cut off all infested limbs and burn them.

The black scale (*Lecanium olea*), apricot scale (*Lecanium armeniacum*), frosted scale (*Lecanium pruniosum*), pernicious scale (*Aspidiotus perniciosus*), are those scale insects which trouble the prune tree most. Some

orchards have not produced good crops on account of having been so badly infested with these pests, the quantity of scale preventing the fruit from growing large and being marketable. The different scale remedies given elsewhere have been well tested and proved to be efficient, provided diligence and pains are taken by the fruit grower when he prepares them.

The following pests are common to the plum and prune in the East, where they have proved very destructive. A vigorous and efficient system of quarantining has so far prevented their introduction on this coast, and little danger is to be apprehended from them:

Plum Curculio (*Conotrachelus nenuphar*).—This pest has been known since 1746, and is an indigenous species feeding upon wild stone fruits. The damage done by the curculio in the Eastern orchards is too well known to require a detailed account here. It is also known that the insect has increased enormously in sections where cultivated varieties are grown. Up to the present time the curculio has not been found in California, and care should be taken to prevent its introduction, as it would ruin our prune industry.

Root Borer (*Ægeria existosa*).—Trees grown on peach stock imported from the East must be carefully examined, and if found infested with the pest must be destroyed. These insects will ruin a tree in a very short time.

YIELD.

The prune is a prolific bearer and can be relied upon for annual crops. Unlike many fruits, it does not take an occasional season's rest, but will yield its average returns every season. If properly cultivated some fruit may be gathered the third year, and the fourth year will yield a fairly profitable crop; the fifth year will give from fifty to sixty pounds to the tree, which the sixth year should double. From this time on the tree can be considered as in full bearing, and will give from one hundred and fifty to three hundred pounds of green fruit annually. The average yield for Santa Clara County is about three hundred pounds per tree. In some instances six hundred to eight hundred pounds to the tree are reported, and one six-year old tree in Visalia is credited with eleven hundred and two pounds of green fruit in one season.

CHAPTER III.

PICKING AND CURING.

PROCESS OF GATHERING.

The prune is picked from the tree when fully ripe, which is indicated when it passes from light reddish to purple, and by the withering condition of the fruit. It is very important that the fruit be thoroughly ripe, or else when dried it will be devoid of that rich flavor so essential in a marketable fruit. In most sections the prune upon ripening has a tendency to drop to the ground, which fruit is gathered and processed with the rest of the crop. The picking of the fruit, simple as the process appears, is one of the most particular things in prune culture. Many of the leading growers go over their orchards eight or ten times, gathering the ripest fruit each time. People are kept continually at work in the season gathering the ripe fruit. Starting at one end of the orchard they will work it over, and by the time they have got through the part first gathered is ready for the second picking, and this is repeated until the entire crop is harvested. The object is to get the fruit in its prime condition—rich, full, meaty, and thoroughly ripe. If it dries a little on the tree and begins to shrivel it is none the worse. The fruit is usually allowed to drop on the ground, from whence it is gathered, and no greater assistance is given it in falling than the gentlest tap on the trunk of the tree; a severe shaking even is not allowed. At the last picking the fruit that remains on the tree is gathered with that which has fallen. By this method the fruit is assured of positive ripeness, is solid, and is charged with saccharine matter so desirable in the cured article. The prune will generally drop from the tree when fully ripe, and will not rot even if left on the ground under the trees for several days. As the fruit shows indications of ripening the ground under the trees is generally cleared of all rubbish and worthless fruit, so that when the mature fruit does fall it can be gathered by itself, free from rubbish. Sometimes a sheet is placed upon the ground under the tree and the ripe fruit is shaken into it, after which the sheet is picked up by the corners and the fruit turned into boxes and loaded on a wagon to be taken to the drying ground.

GRADING AND CURING.

Prunes are usually graded before drying, and various home-made contrivances are employed. Some use inclined planes of adjustable slats, the grader being thus available for other fruits than prunes; the large fruit rolls along into receptacles at the bottom, while the small fruit falls through into other receptacles. Other grading devices are made with wire screens, or riddles of different sizes of mesh. Some of them work on the principle of a fanning mill, three to four riddles

placed above one another, each with a slight incline, and a spout on the side, where each grade drops into a box. Some have a long riddle, say twelve feet long, with three different sizes of wire screen on it. This riddle is hung upon four ropes, with an incline; the prunes are thrown in at the higher end, and by shaking it they roll down and fall through the holes into boxes underneath. The first piece of screen should be small, to let only stems and dirt through, and no prunes. This long hanging screen is also used to grade prunes after drying.

The object to be attained by grading before drying is equality in drying. The smaller fruit dries more rapidly than the larger, and by grading it into two or three sizes, as it comes from the tree, greater uniformity in evaporation is secured, and a more even quality of finished fruit is the result. The grader also removes all twigs, leaves, or other foreign substances which may have become mixed with the fruit in picking.

The next process to which the fruit is subjected is known as dipping. This is one of the most important processes in the whole preparation of the prune for market, and much of the success of the pack will depend upon the person having it in charge. The ripeness of the fruit, the toughness of the skin, and other peculiarities of the fruit, have got to be considered in the preparation of the lye into which it is dipped, so that no certain rule can be laid down. The object to be attained is to remove the bloom, which fills up the pores, and at the same time crack the skin of the fruit so that evaporation may take place more rapidly. In its natural state the skin of the prune is almost impervious, and unless dipped the fruit would consume weeks if not months in drying. The usual strength of the dip is about one pound of concentrated lye to each ten gallons of water. The proper strength, however, must be left to the judgment of the operator, and the lye must be sufficiently strong to crack the skin of the prune. The lye must be kept boiling hot during the operation, and not allowed to cool by the immersion of the fruit. The length of time required for immersion also varies according to the toughness of the skin, the soil upon which the fruit is grown, and the age of the orchard, fruit from old orchards and heavy land being tougher than that from young orchards and freer soils. The average time required is about thirty seconds, but the fruit must be withdrawn as soon as the skin shows minute cracks on its surface. If left too long the sugar will ooze through the cracks in drying, rendering the fruit sticky and disagreeable to handle, and causing it to lose much of its best qualities; if it is removed too soon it will not dry well. After their removal from the lye bath the scalded prunes are next plunged into clean, fresh water, which rinses off all the lye that may have adhered to them in the first operation. This water must be changed frequently to prevent its becoming too heavily impregnated with lye. For dipping, the fruit is put into wire baskets or galvanized pails with perforated sides and bottoms. In the Buxton orchard, at Campbell, in Santa Clara County, a very ingenious device is used which does the work automatically. The prunes are taken direct from the orchard and unloaded into a bin. Elevators raise them to the grader, which removes all twigs, leaves, and rubbish, and assorts the fruit into two sizes. These two sizes each fall onto an endless apron, provided with carrying slats, and are carried through the lye baths, which are kept at a boiling pitch by steam pipes, a separate bath being provided for each sized fruit. The

apron continues from the lye bath into the rinsing bath, which is kept fresh by a continuous stream of pure water which flows through it, and from the rinsing bath the fruit is delivered to the trays.

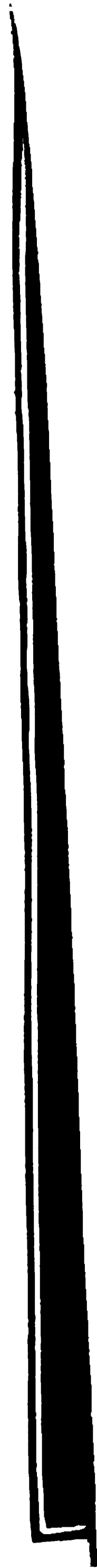
Drying is done wholly by the sun. A number of experiments with driers have been made, but the machines were found wholly inadequate to handle the crops, and sunshine was found so much superior that they have fallen into almost complete disuse, and are now used to so limited an extent as to require no consideration in connection with the prune industry. After the fruit comes from its second, or fresh-water dip, it is spread evenly on trays of a convenient size, usually about two by three feet, made of thin lumber and easy to handle, and these trays are placed on the drying ground, a space which has been carefully selected with a view to its full exposure to the sun. The drying season extends from the middle of August until the beginning of November. The length of time required for the complete desiccation of the fruit depends upon the weather, its heat, and the humidity of the atmosphere.

In hot, dry conditions the fruit requires a shorter exposure than where it is cool and moist. The drying period will vary under these circumstances from a week to a month, and the time at which to remove the fruit from the drying grounds must be left to the judgment of the operator. It should, however, be sufficiently well dried to warrant its keeping under all conditions, but not so dry as to rattle. When sufficiently dried the fruit is taken to the processing house, where it is put into bins to "sweat." This operation requires from two to three weeks, during which period the fruit must be carefully shoveled over several times and thoroughly intermixed. At the end of the sweating season it assumes a black, glossy appearance, and resumes somewhat of its original plumpness.

A very good idea of a California prune-drying scene can be had from the large illustration given herewith, which shows the grounds of Frank Buxton, at Campbell, in Santa Clara County. On this ground, which covers over twenty acres, over ten thousand trays of prunes are dried at one time. From the smaller illustration a good idea can be formed of the way prunes are dried in different orchards throughout the prune sections of the State.

FINISHING.

The next process is that of "finishing." This comprises a second bath, to which the now dried fruit is subjected. This bath is simply boiling water, to which is added such ingredients as the judgment or the whim of the individual grower may fancy will improve the appearance or quality of his fruit. The objects to be attained in the second dipping are to destroy whatever insect germs may have become attached in drying, and to soften the skin. The fruit should be left in the bath until partially cooked and these ends are accomplished. Some growers add sufficient salt to the dip to make a fairly strong brine, and this has the advantage of increasing the heat of the water several degrees beyond that to which fresh water can be heated, and making its effect surer. Others add a small quantity of glycerine, glucose, fruit juices, and some few logwood or indigo. This is done for the purpose of improving the appearance of the fruit and adding to its gloss and color. Many of the most experienced packers decry the addition of any of the last named articles, claiming that they are ineffective and do not add



either to the quality or appearance of the fruit. In about three hours the fruit will be sufficiently dry for packing.

Before passing the finishing process the fruit is once more run through the grader and assorted into standard sizes for the market. There are usually six sizes: first, those ranging from forty to fifty to the pound; second, fifty to sixty; third, sixty to seventy; fourth, seventy to eighty; fifth, eighty to ninety, and sixth, all below ninety.

PACKING.

The final operation in the handling of the prune is packing, and here again great judgment is required in putting up a thoroughly good article, that will present an attractive appearance and force its way on the market. Great care must be exercised that no fruit be packed until all surplus moisture between the fruit has entirely disappeared, for if packed while damp the fruit will mold in the packages; at the same time all fruit that is overdried must be thrown out. The skillful packer can tell by the sense of touch just what fruit is fit for packing, and that which is not, as he runs his fingers over the piles before him. Much of the fruit is packed in boxes of ten, twenty-five, and fifty pounds each, but of late there is a growing demand for fruit in sacks, and large quantities are now shipped East in hundred-pound sacks, where it is either boxed by the Eastern dealer or sold direct from the sacks to the consumer.

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CHAPTER IV.

PRUNES IN EUROPE—PRODUCTION AND MARKETS.

THE FRENCH METHOD.

George W. Roosevelt, United States Consul at Bordeaux, gives the following account of the French method of preparing the prune for market:

“When the prune is ripe it is covered with a sort of glaucous powder, called flower, which greatly adds to its value as a table fruit. As the gathering is an important factor in the subsequent value of the prune, great care and good management are indispensable. The fruit is usually gathered after the heat of the day has dissipated the humidity of the night. When possible, straw is carefully spread beneath the trees to prevent the fruit coming in contact with the earth. The prevailing custom, however, is to harrow the ground before gathering the plums. Only such fruit as readily falls when the tree is slightly shaken is gathered. As soon as harvested the fruit is taken to a building, properly called the fruitery, where it remains for a few days to complete maturity. Prunes are subjected to not less than three, and frequently to four, distinct cookings before being pronounced ready for market. Each of these operations has a special end, in sight of which great care is demanded. The first two preliminary cookings have for object evaporation of water contained in the fruit, and preparation for the final cooking, which dries the fruit and imparts a certain brilliancy much sought after by buyers. Sun-dried prunes are most delicious in taste, but the exigencies of the trade do not permit of such long preparation. In several districts of France most primitive means are practiced in curing the fruit for market. In Provence the freshly gathered fruit is plunged into pots of boiling water, where it remains until the water again arrives at a boiling point. It is then removed from the boilers, placed in baskets, and gently shaken until cool, when it is put upon long trays and exposed to the heat of the sun to complete desiccation. At Digne the prunes are not gathered until completely matured. Women peel the fruit with their nails to avoid injury to the soft pulp. The fruit is strung upon small twigs, and in such fashion as not to touch. These sticks of prunes are stuck into straw frames, which are suspended in the sun, until the prunes easily detach from the stick; the pit is then removed, the fruit placed upon trays, exposed to the sun, and when thoroughly desiccated packed for market.

“In the departments of Indes-et-Loire and Lot-et-Garonne immense ovens purposely constructed for prune cooking are used, but the proprietors often suffer loss from want of more commodious cooking apparatus, especially in windy or stormy weather, when the fruit falls in an embarrassing abundance, and he finds himself without means of immediately curing or preserving it. Most prunes are subjected to a preliminary washing to free them from dust or sand that may have adhered to them

in falling to the ground. After washing, the fruit is exposed to the sun or air on beds of straw, or the trays upon which it is to be cooked, to rid it of all humidity. When dry it is spread in a single layer on the tray and at once submitted to the oven. The trays used in rural districts are quaint affairs, varying in form, dimensions, and construction, according to locality. They are made during the winter months by peasants, are clumsy and cumbersome, and the only excuse for their use is that the peasant cannot afford to buy, and is not skillful enough to make better ones. They are very primitive in their construction, consisting of a frame made of hoop, to which is fastened a wicker-like bottom fashioned from rushes or willow twigs. They hold from twelve to eighteen pounds of green fruit, representing about four or six pounds of prunes. Care is exercised in preparing the oven for the first cooking that the degree of heat shall not exceed 50 degrees Centigrade, and in the second not over 70 degrees. If the heat is too strong an ebullition is produced in the fruit, the skin bursts, the juice discharges, the prune becomes sticky, loses its flavor, and consequently its commercial value. After each cooking, which occupies about six hours, the fruit is removed from the oven and exposed to the air. When the prunes are cold they are carefully turned by women specially charged with this duty. They avoid disturbing the fruit while it is warm, as the touch renders it glutinous, and prevents the juice from congealing. The third cooking is performed at a temperature of 80 to 90 degrees, and occasionally at 100 degrees. This, like the two preceding, should be conducted under most intelligent care. After the third cooking the prunes are sorted, and such as are found imperfectly cooked are again submitted to the oven. The degree of perfection in cooking is obtained when the fruit presents a dark purple color, solid and brilliant surface, malleable and elastic to the touch, and when the kernel is well done and intact in the shell. When these conditions are not obtained the kernel ferments, and alters the entire prune, which very soon molds and becomes worthless. Each cooking should not consume more than six hours. In the last, however, the process is sometimes prolonged, depending upon the condition of the fruit. The fruit loses about 70 per cent of its original weight. The dark color depends largely upon the degree of maturity at time of gathering. The brilliancy of surface has no other commercial value than proving the cleanliness observed in preparation and attracting the attention of buyers. Besides the different usages of the prune as an aliment, it is also employed in producing an agreeable brandy.

"Prunes are divided into ten categories, taking the number of prunes necessary to a pound as a basis, and were formerly classified as follows: (1) Trash or refuse, more than 125 to the pound; (2) small prunes, 120 to 125 to the pound; (3) small ordinary, 110 to 115 to the pound; (4) fine ordinary, 100 to 105 to the pound; (5) superior ordinary, second, 90 to 95 to the pound; (6) superior ordinary, for exportation, or half choice in France, 80 to 85 to the pound; (7) first choice, 70 to 75 to the pound; (8) extra choice, 60 to 65 to the pound; (9) imperial, 50 to 55 to the pound; (10) imperial flower, 40 to 45 to the pound.

"This classification offered opportunities to sell inferior prunes for those of good quality, and to prevent this abuse was changed and simplified as follows: No. 1 represents 90 to 92 to the pound; No. 2 represents 80 to 82 to the pound; No. 3 represents 70 to 72 to the pound; No. 4 represents 60 to 62 to the pound; No. 5 represents 55 to 56 to the pound; No. 6 represents 44 to 45 to the pound; No. 7 represents 40 to

41 to the pound; No. 8 represents 34 to 35 to the pound; No. 9 represents 30 to 31 to the pound.

“When ready for exportation the fruit is pressed flat between two cylinders covered with rubber, and then packed into cases by a special machine called a packer. Many dealers still perform this operation in the primitive manner of foot pressure, which is simple, speedy, and equally as satisfactory. Bordeaux is the principal center of this particular commerce, which is yearly increasing. Besides the large amount of prunes exported to European countries by way of rail, there are about one hundred vessels annually leaving this port loaded with this valuable and succulent product. The most important exportation of this production is to the United States. During the past eight years \$4,553,000 worth of prunes, or an average of \$569,125, have been invoiced through this consulate, as will be seen by the following:

1880.....	\$219,736 68
1881.....	525,052 58
1882.....	369,150 64
1883.....	681,166 69
1884.....	577,480 58
1885.....	792,640 96
1886.....	840,299 19
1887.....	568,356 82
Total.....	\$4,553,884 14

“In the beginning of the prune industry many devices were employed for their proper conservation. The first ovens were very primitive, and the work of preparing the fruit for market laborious. At present there are many different kinds of ovens in use, possessing more or less distinct features, but about the same in general principles. The most generally used are the Bournel and the Marletean ovens. The only ovens in use are of French patent and make.”

PRODUCTION AND MARKETS.

The principal markets for California prunes are Chicago and New York, by far the greater portion being shipped to Chicago. Some smaller shipments are also sent to Philadelphia and Pittsburg. From these central points the product finds its way to the retailers, and thence to the consumers of the country. Although but a comparatively new aspirant for public favor, the California prune has forced its way in advance of the imported article, and brings from 2 to 2½ cents per pound more than the French prune sold in competition with it. The proportion of pit and skin to meat in the California fruit is much less than in that of the French article, while the proportion of saccharine matter is much greater. These features give our domestic fruit its great advantage over the imported article. This popularity should be no surprise, as the California French prune is a different article from the imported French prune. Our prunes, as every consumer knows, are more like dates, and when cooked are of a most delicious flavor. Besides this, dealers have found out that the California prune keeps better and longer without sugaring than the imported goods.

The prune crop of 1889 was variously estimated at from fifteen million to eighteen million pounds, and it was sold at fair prices, ranging from 5 to 9 cents per pound, the average in the market being 2 cents

higher than the imported. The crop of 1890 was expected to fall short, owing to excessive rain upon the bloom, and the excessive moisture in the soil, which caused much of the fruit to drop after having attained a fair size. At the end of the season it was apparent that the output was but very little, if at all, less than the preceding year. Prices for green fruit delivered at the driers ranged from \$21 to \$30 per ton.

The amount of prunes now consumed in the United States is enormous, but the consumption is capable of great enlargement as the superior quality of the Pacific Coast product becomes better known. It will be years before the demand on this side of the Atlantic can be supplied, and when that shall have occurred there will be the market of Europe and the rest of the world to supply. The immense area devoted to prune culture this season (1891) testifies to the profound confidence felt in the future of the industry by the people of California, and that confidence certainly appears well founded.

The following table gives the foreign import and California production for the six years from 1885 to 1891, inclusive:

YEAR.	Foreign Imports, by Years, Ending June 30.		California production, by Years, ending December 31— Pounds.
	Pounds.	Value.	
1885.....	57,631,820	\$2 05 00	.....
1886.....	64,996,546	2 46 00	2,000,000
1887.....	92,032,626	2 48 00	1,825,000
1888.....	70,626,027	2 50 00	2,100,000
1889.....	46,154,825	1 04 00	15,200,000
1890.....	58,068,410	1 76 00	12,200,000
1891.....	34,281,322	1 86 00	27,000,000

Professor Allen, of San José, speaking of the rapid growth of the prune industry, says:

"The first shipment of prunes was made in 1867, by J. Q. A. Ballou, one of the oldest orchardists in the valley, and was consigned to A. Lusk & Co., of San Francisco; there were about 500 pounds of dried French prunes in the consignment. This was the first shipment of prunes from the valley, and comprised the entire crop. During the fall of 1891 there have been shipped from San José, alone, 19,207,165 pounds. There are at least 2,000,000 pounds more awaiting shipment.

"Mr. Ballou raised his fruit from about fifteen trees, at which time there were not more than one hundred trees in bearing in the valley. Now there are not less than one million, one half of which are in bearing."

The importation of prunes into the United States for the year 1890, to December 31, was 61,905,782 pounds, valued at \$2,819,420, an increase over the importations of 1889 of 18,188,429 pounds, and an increased value of \$584,029. The product of the State of California for the same period is given for 1889 at 15,200,000, and 1890 at 12,200,000, or 28,517,353 pounds less than were imported in 1889, and 48,705,782 pounds less than were imported in 1890. It would appear that while the United States imports from three to four times the quantity of prunes produced by California, there is still a large field for our domestic fruit, and that, with our continually increasing population, the danger of oversupply is still very remote, and prune growing in California may be relied upon as a profitable industry for years, if not for generations yet to come.

PART III.

NEW VARIETIES OF FRUIT, AND METHODS OF
CURING AND ADULTERATIONS.

CHAPTER I.

NEW VARIETIES OF FRUITS.

During the past year there were several hundred specimens of all sorts of fruits received at this office, and to enumerate them all would be time and space wasted, as the majority possessed no qualities of any real merit. It is the duty of this department to examine into the relative merits of such varieties and new fruits as come under its notice, and to report such facts of general interest to the public. No sooner is such a report made than we are flooded with inquiries, asking, in the main, as to where and from whom they can be purchased, etc. (information which we must decline to supply), and suggest that in future such communications be addressed to nurserymen. Among those worthy of notice are the following:

PEACHES.

Parker.—Specimens of this peach were received from Poway, San Diego County. The peach is a seedling from the Early Crawford, and originated about ten years ago in the orchard of J. C. Parker, near San Diego. This peach has become quite famous locally, and, I judge from its appearance and quality, will become a popular variety.

Fruit large, oblong, swollen; skin remarkably clear, transparent, and free from down, yellow, with dark red cheek; flesh yellow, red at the pit (an objection for canning), fine grained, juicy, and highly flavored; freestone, sometimes adhering very slightly to the pit. Ripens with or a little earlier than the Foster. Tree vigorous, with abundant stocky branches, usually setting full, but not excessive crops.

This variety is commended as a drying peach, and is said to also possess splendid shipping qualities.

Galbraith.—Originated by W. A. Galbraith, of Santa Cruz. On August 24th I received a box of this handsome peach from Santa Cruz, which, upon examination, showed them to contain qualities which place it among the list of worthy kinds to propagate. It is a chance seedling, resembling the Late Crawford, but of higher color and sweeter. The fruit is large, with very little coloring at the pit, and, when fully ripe, very luscious, and the skin peels off very readily. The tree is a vigorous grower and free from curl. A valuable peach for drying.

Queen of the West.—This is a valuable shipping peach; ripens September 1st. Originated at Lancha Plana, Amador County. The fruit is large, white, with a red blush, and very red at the pit, which is against it for canning purposes. Very highly flavored; a freestone. The tree is a good grower, and is said to be free from curl.

PLUM.

Plantz Seedling.—Originated by W. A. Plantz, of Newcastle, and is a chance seedling. It is a splendid shipper, and ripens in that locality about three weeks ahead of the Hungarian prune. On August 24th

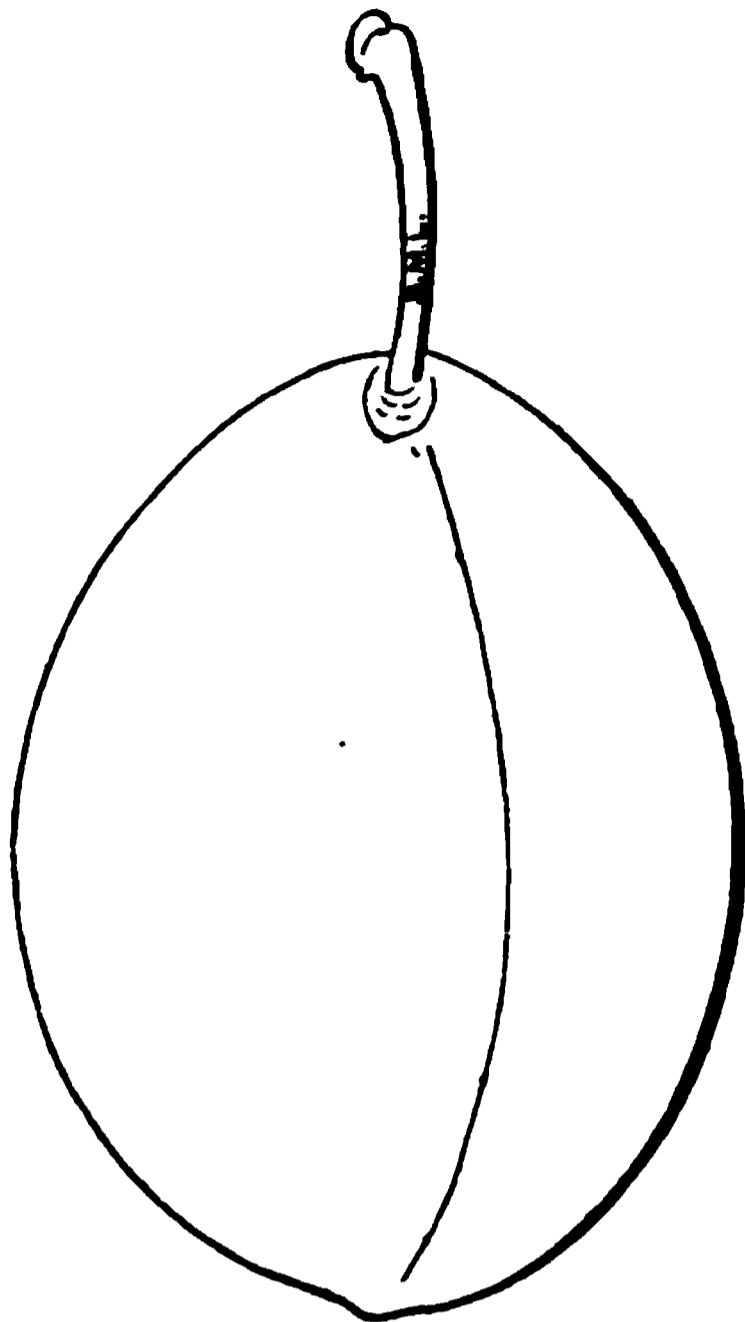


Fig. 1.

last I received a box of these plums, and kept them for eight days without the slightest trace of deterioration. It is, no doubt, a seedling from the Victoria, its resemblance having been fully traced, but of a better quality, and larger and much more handsome in appearance. The tree is a good bearer and a thrifty grower. Fruit large, oval, tapering towards the stock, reddish purple, covered with a light blue bloom; flesh yellow, sugary, rich, juicy, and sweet. The first plums were picked from this tree three years ago, bearing in all about two boxes. Last year it bore six boxes, and this year (1891) twelve boxes and five crates. The pit is perfectly free when ripe. The tree is now about eight years old, and continues to bear quite heavily. It is a valuable shipping plum, and is worthy of propagation.

ORANGE.

Joppa.—A very promising variety; can be marketed early, being sweet from about the time it commences to color, or can be left until May and June without deterioration in quality. Fruit (Plate II) oblong, medium to large, uniform, practically seedless, distinguished by a well-defined corona at the blossom end; thin rind, solid, and free from rag; pulp very fine, sweet, and juicy; resembles the pulp of the Washington Navel. The fruit does not drop from the tree, is very tenacious, and of a deep red color. The tree is thornless, an upright and vigorous grower, attains the bearing surface of thrifty seedlings, and is a heavy bearer. Foliage large, dark green, symmetrical, and very abundant, lanceolate, petiole prominently winged on either side. Originated in 1879 by A. B. Chapman, of San Gabriel, from seeds obtained from Joppa, Pales-

tine, and Mr. Chapman named it "Joppa," in order to indicate the locality of its original home in the Holy Land.

APPLE.

Purcell.—This beautiful apple was originated by Felix Purcell, of Covelo, Mendocino County. It is no doubt a seedling from the Yellow Bellflower, and resembles it strongly; very handsome in appearance,

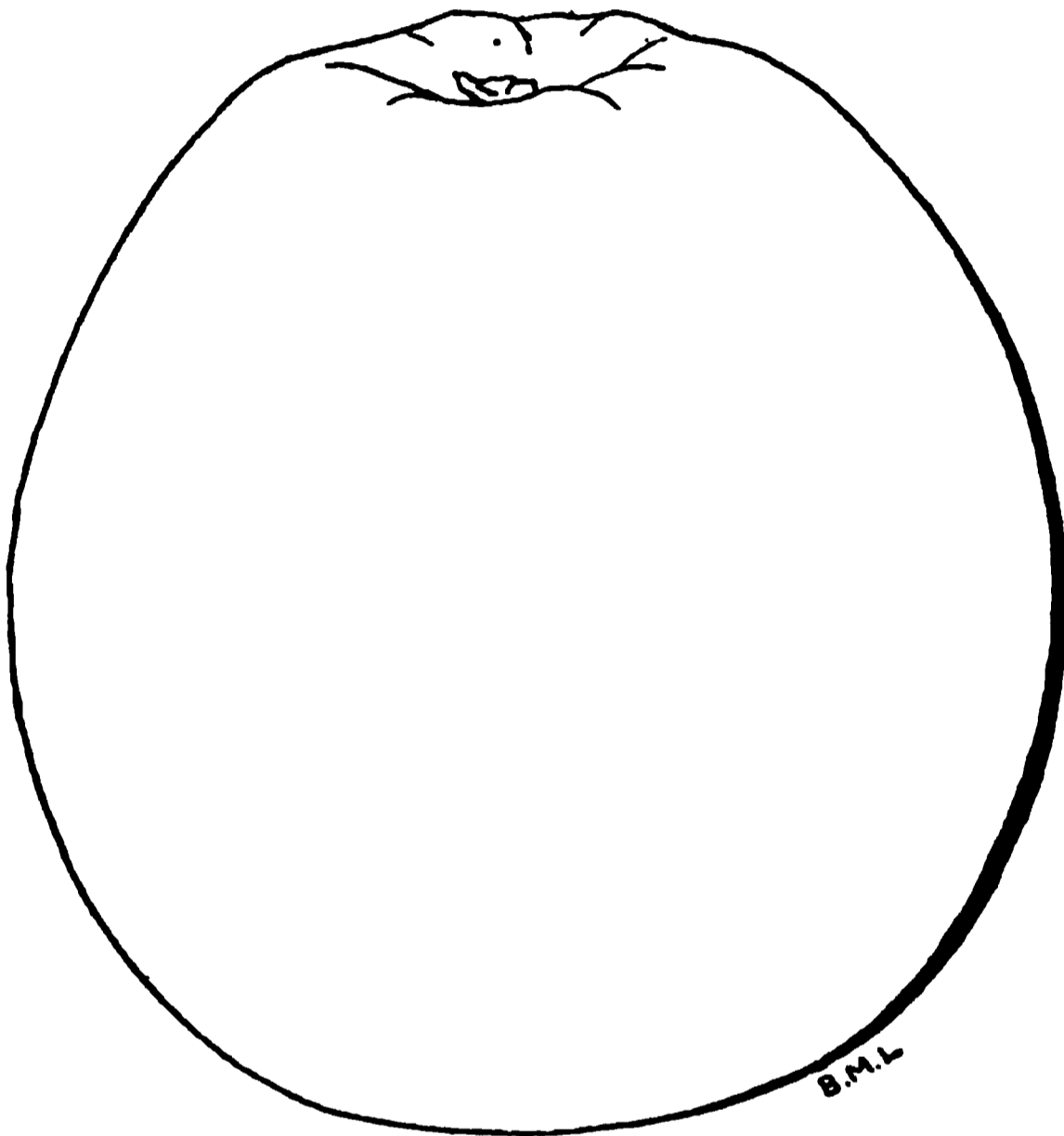


Fig. 2.

smooth and aromatic. Fruit bright yellow, medium oblong, and very regular, tapering towards the blossom end; flesh tender, crisp, juicy, very rich, and of high flavor. Tree a rapid grower and an excellent bearer. A good keeper, specimens in January being very firm.

GRAPE.

Pierce (Syn. *Isabella Regia*), *Plate III.—This grape is destined to become one of the most popular of table grapes known in our State, and will become more so when its merits become better known. It is an exceedingly strong grower and a prolific bearer. The foliage is remarkably large and handsome. Bunches long shouldered and loose. Berries are of extraordinary large size—twice as large as those of its parent *Isabella*; color purplish black, covered with a light blue bloom, and when ripe are exceedingly sweet, delicious, and slightly aromatic, the pulp readily dissolving; seeds small, and smaller than the seeds of the *Isabella*. This grape for the past six years has been known in the market

* Errata in Plate III, read name "Pierce."

under the name of "Isabella Regia," which has been changed to Pierce to avoid it being confounded with the Isabella.

J. P. Pierce, of Santa Clara, has an arbor about one half mile long, which was planted by William Lent, a mining man, about thirty years ago, but originally there were more than two miles of arbor, which Mr. Pierce rooted out. These arbors were planted with American grapes, and among them were a large number of Isabellas. About twelve years ago Mr. Pierce noticed his children trying to reach a bunch of grapes with a stick; this attracted his attention, also, as the bunch and berries were of a very large size, at least three times as large as the Isabella. He then marked the branch, and in the spring following grafted other vines with cions from that branch. The second year the branch produced a number of bunches of extraordinary large size. The following winter Mr. Pierce removed all the side branches to throw all the force into that one branch, which continued to bear the same quality and size of grapes. He then propagated from it quite extensively, and now has about two acres in bearing on their own roots. He has also a great many grafted vines which have done equally as well. No variations have as yet been noticed, they remaining constant bearers. The berries are not quite as strong in musky flavor as the Isabella. The old vine in the arbor still remains, and, peculiarly, one branch bears the Isabella and the other this grape.

CHAPTER II.

ADULTERANTS IN OLIVE OIL.

The question of adulterants used in adulterating olive oil has greatly exercised the minds of consumers, and the fraud having been so largely practiced an investigation was had, and the results of that investigation were really appalling. Merchants and others were found to adulterate olive oil with foreign agents, and sold as pure olive oil. The business was conducted on such a large scale, and so greatly to the detriment of the olive oil industry of the State, that a Convention of olive growers was held in July, 1891, and measures were taken to suppress the outrageous practice.

The State Analyst, W. B. Rising, was appealed to for aid. He promptly responded to the request, and, after a careful investigation, submitted the following preliminary statement:

REPORT OF THE STATE ANALYST.

"One of the important industries of California has been much injured and retarded because of the unfair competition to which it has been subjected by unscrupulous dealers and manufacturers. I refer, of course, to the olive oil industry, and to the adulteration which is generally believed to be very largely practiced.

"When I received from Mr. Lelong, the Secretary of the State Board of Horticulture, a communication asking me to make a study of the methods of detecting adulterations in olive oil, I felt that my duty as State Analyst, and my loyalty to the welfare of this State, demanded that I should do all in my power to solve this question. I realized that the honest oil maker was in great danger, and that he had a right to the best efforts of those who could help him. It is one of the legitimate functions of our State government to protect the honest citizen against the frauds of those who would adulterate any food or medicine for gain. No denunciation or condemnation by the public is too strong for such lawless and heartless pirates upon helpless and innocent victims.

"In a word, the question of *food adulteration* is of the highest importance, affecting, as it does, every person in the whole country. It also has a commercial bearing, discouraging honest industry. Especially is this felt by the olive grower, who tries to build up a great industry for which California is so well adapted. If the olive oil maker can be defended in his rights, in ten or twenty years the industry will have attained immense importance. Already it has been demonstrated that for delicacy of flavor and fine quality we have nothing to fear from the competition of the world. An honest competition we do not object to. We cannot, however, compete with mustard-seed oil, cotton-seed oil, peanut oil, to say nothing of the inferior oils which may be substituted

for the honest oil by unscrupulous adulteraters. The men who as pioneers have built up the industry, may well be proud of the success they have attained. The fact that adulteraters wish to brand their oils 'California pure olive oil,' is all the evidence that is needed to convince any one that our own pure oil is all that is claimed for it.

"The first step toward self-protection is to procure evidence that adulteration is being practiced. This task has fallen to me, partly because of the official position which I hold as 'State Analyst,' and partly, I suppose, because of the appliances and facilities which I can command for doing this work. I entered upon this work with a full appreciation of its importance, and of the responsibility placed upon me. I did not expect any easy solution of the problem. I have not looked for easy or quick methods. I expected that all the skill and training of an experienced chemist would be needed to solve the problem given me. The literature on the subject is simply enormous. Good methods and bad methods, practical and impractical methods, special methods and general methods, are crowded together, and the inexperienced oil chemist neither knows their value nor their use.

"The successful completion of the task assigned me required a careful examination of the various methods suggested, testing each upon pure oils and upon adulterated oils, adopting the useful and rejecting the useless methods. This work was begun and has been carried forward far enough to make a statement of results obtained. I cannot say that the work has been finished, inasmuch as many experiments remain to be made, and many studies begun should be continued; but I do feel prepared to say that the most important methods have been successfully studied and used, and that they give results which cannot be questioned. It is not safe to depend upon any single method, but by using many the imperfections or insufficiency of one is supplemented and explained by the others. My experience has been that there is a perfect harmony and agreement among the various methods used, so that the possibility of mistake is almost impossible.

"It may fairly be assumed that oils of different origin possess a different constitution. By this I mean that olive oil is only obtained from the olive, and cotton-seed oil only from the cotton seed, and lard oil only from lard, etc. Each possesses certain properties which are characteristic, and which are not possessed by any other oils. The solution of the problem, then, depends upon our ability to recognize and determine these characteristics wherever they may occur. Every property of these various oils which can be recognized with certainty is of importance in detecting adulterations. There are many persons who have a taste so delicate and so cultivated that they can detect, with a good deal of certainty, the presence of many adulterants. Lard oil, peanut oil, especially if not well refined, are easily so detected. The color of an oil is not so characteristic, and depends upon less essential qualities, and varies according to ripeness, kind of olive, etc. The expert olive oil dealer and maker becomes accustomed to these properties, and can form a very good opinion of the oil from his own district, which he is accustomed to see and handle. The chemist dare not lay too much stress upon them. He receives them as a hint or suggestion to look carefully for such or such adulteration, but he dare do no further. He must furnish positive and tangible proof, and not impressions or beliefs.

"We may begin our study by taking up the *physical properties* of the oil, and when we have determined the more important and characteristic of these, then take up its *chemical properties*. Under physical properties we may examine its specific gravity, its index of refraction upon light, its viscosity, etc.

"The specific gravity of pure olive oil is very nearly constant at any given temperature. If this can be accurately determined it will indicate pretty certainly the purity or impurity of the oil under examination. This test is worth nothing, is *worse than nothing*, unless made with all the care and skill of a dexterous experimenter. The margin of difference between olive oil and many oils used to adulterate it is not large, but constant. Expressed in numbers the specific gravity of olive oil is .9156 to .9162, cotton-seed oil, .9225 to .9236, peanut oil (commercial), .9209, etc.

"At the outset it may be well to say that the chemist feels bound to get at the *nature of the oil* he is examining, as far as possible, to learn as much of its physical and chemical properties as he can, and then when he has determined all these he collects his results together and compares them with those obtained for pure oils. If the oil contains, as it sometimes may, a large amount of free acid from decomposition, this will change to a certain extent its physical properties. If this is known the explanation is at hand for what otherwise would be or might be misinterpreted. In a word, if we are to solve a problem containing a number of unknown quantities we must have a requisite number of equations. The more nearly we can fulfill this condition the more nearly does our conclusion come to an absolute demonstration.

"*The index of refraction* is a valuable indication of purity or impurity. I have found this index for pure olive oil at 16 degrees Centigrade (60.8 degrees Fahrenheit), 1.4699 to 1.4708; cotton-seed oil, 1.4734; sesame, 1.4735; mustard-seed, 1.4742. The illustrations which I have given are sufficient to show that we have a margin, not large, but still sufficient to give us a good indication.

"The viscosity of the soap made from the oil I believe will be a good indication of purity. This test was first devised by Dr. Babcock, and used by him to detect adulterations in butter. When I visited his laboratory some four years ago, I at once conceived the idea of applying it to the testing of oils for adulterations. Accordingly, when I began this investigation I asked Dr. Babcock if he would be willing to apply the test to olive oils. This he very kindly consented to do, and the results obtained by him agreed perfectly with the tests made in my laboratory, using standard methods. It is too soon to make any positive statement in regard to the use of the viscometer, but this much I do think, that it promises to become a useful method for detecting adulterations in olive oil. I shall subject it to a long and careful series of tests, hoping that I am not expecting too much of it.

"Passing to the examination of the chemical properties, I would mention as one of the greatest importance, the amount of iodine absorbed by various oils. Here we have quite a wide margin, and small amounts of such oils as cotton-seed, mustard-seed, arachis (peanut), rape, sesame, are recognized.

"A pure olive oil may absorb from 78 to 88 per cent of iodine. The oils named absorb more, and so much more that we have no reason to doubt the cause of the large absorption. A foreign oil which possesses

that property is present. Of the many tests which I have made not one has shown any discrepancy from the above statement. If the amount of iodine absorbed was large, it was because cotton-seed or some other oil with high absorption power was present.

"When olive oil is mixed with sulphuric acid of a given strength and in proper proportion, the temperature rises from 33 to 41.5 degrees Centigrade. Numerous experiments have been made with this test, and in all cases these limits have not been exceeded by California olive oil. I have convinced myself that this test is thoroughly reliable in skillful hands. Cotton-seed oil gives a rise of temperature of 67 to 70 degrees Centigrade; sesame oil, 68 degrees Centigrade; arachis or peanut oil, 65 degrees Centigrade; rape or colza oil, 57 to 58 degrees Centigrade. The difference between the highest temperature reached with olive oil and the sulphuric acid, and the lowest given by the cotton-seed, sesame, peanut, or rape, and oils of the same acid, is so great, 20 to 30 degrees Centigrade, that there is little chance of making a mistake. Only adulterated oils can give this high temperature.

"When oils are treated with nitrous acid and allowed to stand for a few hours they show different consistencies, which are characteristic of the oils. Olive oil, lard oil, sperm oil, and sometimes peanut oil will give a *solid, hard mass*. Mustard, peanut, sperm, and rape oils will give a *butter*, while rape, cotton-seed, and sesame give a pasty or buttery mass which separates from a fluid portion.

"The melting point of the fatty acids obtained from oils gives another indication of their nature, and if above 30 degrees Centigrade indicates beyond doubt adulteration.

"*Color Tests for Oils.*—Many oils give characteristic colors when treated with acids of varying strengths and under varying conditions. Nitric acid added to olive oil, and tube immersed for five minutes in boiling water, becomes colorless; rape-seed oil becomes red or orange, cotton-seed the same. I will not here mention the whole list of tests which we have used. I may at another time place in print full and detailed directions for detecting adulterations of olive oil. At this time I have attempted to give a general statement of the methods used, so that a conclusion could be drawn in regard to their accuracy. I will add, however, certain special tests which are more or less well known to the public. I refer to the *Bechi* test for cotton-seed oil. This test has been adopted by Cannizaro in the Italian laboratory, for the investigation of foods, after many and long trials. Many complaints have been made against it, but the real cause I think is to be found in the neglect of proper precautions. The reagent must be prepared with great care and carefully tested with known oils, before applying to unknown oils. In my laboratory we were obliged to prepare several samples of reagent before a correct reaction could be obtained. I feel that the failure of many chemists to get the cotton-seed oil test with the *Bechi* reagent was due to a failure on their part to properly prepare the reagent.

"In conclusion I will say that the study of this subject has been one of great interest, and that I have reached the point where many improvements have already suggested themselves, and I hope that I may be able to test them and to make still others.

"When I finished the examination of the oils received from Mr. Lelong, I asked him to test my skill by making some samples in any

way he saw fit and to send them to me simply marked with numbers. In answer to this request he sent me six samples. These were examined by me, using the methods which have already been discussed, and below will be found the returns which I sent him:

Oils Received from B. M. Lelong.

No. of Sample.	Iodine Absorption—Per Cent.	Increase of Temperature, etc., by Sulphuric Acid.	Melting Point.	Bruhl—Albumen and Nitric Acid.	Hydrochlorine Acid and Sugar.	Bechi Test.
1	97.09	49.0° C.	-----	D'k orange.	Sesame.	-----
2	102.30	47.0° C.	-----	D'k orange.	-----	Suspicious.
3	96.99	51.0° C.	-----	D'k orange.	-----	Cotton seed.
4	90.24	46.0° C.	-----	-----	Sesame.	Cotton seed.
5	100.31	59.5° C.	-----	Light.	-----	-----
6	78.86	38.5° C.	High.	Light.	-----	-----

“ [SEAL]

“ W. B. RISING,
“ State Analyst for the State of California, Berkeley, Cal.”

[The above results show plainly the accuracy of the tests, the report indicating the agents used by me in the preparation of the samples furnished the State Analyst.—B. M. L.]

CHAPTER III.

PREPARATION OF THE LEMON FOR MARKET.

For a number of years extensive experiments have been conducted by lemon growers, with the aim to discover, if possible, a process that would keep lemons until such a time as there would be a market for them. Various methods have been tried, and several growers succeeded in keeping the lemon without shriveling or becoming dry on exposure, and thus the California lemon is fast supplanting the foreign. That the growers have been able to place upon the markets a lemon having all the essential points, as well as quality, as late as ten months after being picked, only goes to show what constant experimenting and energy can accomplish.

The success attained by the different growers has been recorded in our former reports, with the hope that others would profit by their experience and be equally as successful. The chapter upon this topic in the present volume is a condensation of the process as given by G. W. Garcelon, of Riverside, which we published in a special bulletin ("Citrus Fruits," 1891), and is considered of sufficient importance to be reprinted in part.

LEMON HOUSE.

"It is not necessary, unless one has a large lot of lemons, to build a very extensive house. Mine (see illustrations) cost me, with all appurtenances, about \$2,500, and will contain six or seven carloads of fruit, properly arranged, to keep from four to twelve months, and in addition I have in the basement two large rooms which I use for storing and packing, also for box material, etc. Feeling confident that the best success in handling lemons will come from each orchardist making arrangements to keep his own fruit, I recommend all growers of lemons to build a house somewhat after my plan, larger or smaller, according to their orchards. In a few words, a plastered room, or rooms, inside an unplastered but closely boarded and ventilated structure, and a hallway running around these rooms, which serves a double purpose, giving an inside passageway to rooms, and allowing what is most essential, the boxes of lemons (newly picked) to be piled up in the outside passage until they gradually throw off excessive moisture and permit any lemon which has been bruised, through careless handling, or otherwise, to develop imperfections, etc., before the lemons are finally put to their Rip Van Winkle sleep. I would also advise that if the basement is not needed, to set the house nearer the ground and shade with trees and vines, which will keep the temperature down, as it is desirable to keep lemons as near the 60-degree limit as possible. The doors should be made to fit close in the inside rooms; no windows. A few windows, with close-fitting shutters, ought to be placed in the outside structure; board tightly outside and inside rooms; and I now think lathing and plastering

on the inside, with movable ventilator in ceiling, would be an improvement on mine. My rooms were plastered on ceiling, and sometimes moisture from spoiled lemons, which were not properly handled before putting in the rooms, caused the plastering to fall.

PICKING.

“When lemons, on well cared-for trees, are from two and half to three inches in diameter, they should be clipped. There should be a good proportion of the fruit, say one half to two thirds, ready to come from the tree from the middle of October to the middle of December, and it would be best to make two separate clippings in that time, for if you make only one some may be too large and others too small. Some growers clip smaller than I recommend, but the three-hundred-to-the-box size is the most popular. The longer you keep the lemon the more it will be reduced in size; you will have to make allowance for contraction—one third to one half—before it is marketed. Every three to four weeks the trees should be gone over for sizable fruit, until all is gathered. Color cuts no figure, only if the tree is not in good condition, or suitable lemons are not all gathered, my rule will not hold. It has been claimed that the first clipped fruit keeps better than the last, and that there is some of the fruit that is not a true lemon. Now, I take no stock in such claims; the trouble comes either from excessive chill, or from lemons which have been overlooked in former clippings; both will spoil and affect those near them after being gathered. Of course, I do not say that there is not some fruit on lemon trees that, through some, as yet, unexplained reason, will be no good. This is true of all fruit, and is not confined to the lemon, or less to first clipping than the others; only wind and exposure will make more of this fruit in later clippings than first.

HOW TO CLIP.

“The grower should provide himself with proper ladders, which may be extension or self-supporting. First, though, he should secure careful, trustworthy men, who will not think it too trivial to carry out the details which must be observed in order to secure success. Do not hurry them; recollect that, although their time costs you money, you will make more by giving them all the time necessary to do this work well, and should not be hired to pick by box or piece. I have never used rings for measurement, although some growers do. It may be an advantage in getting the exact size, yet there is a disadvantage in the fact that some lemons are ready to come from the tree a little smaller than others; and although purchasers desire mostly the three hundred size, yet three hundred and sixty, three hundred and twenty-four, as well as two hundred and fifty, are good sizes. Also, the gloves and clippers which the workmen have to use with the rings delay the work. The eye of a good workman is all that is needed, and if he is at times at a loss, his forefinger and thumb around the lemon will, after he has the diameter, approximate the size wanted. I like oval baskets holding about sixty or seventy-five lemons, lined with burlap, which may be carefully tacked in the bottom, being sure to cover the heads of tacks with the cloth. *Never clip lemons into sacks.* Fastened to the handle of the basket may be a stout, bent wire to attach the basket to the ladder

or tree. Never pull the fruit; always clip. Put the fruit in the basket carefully, and when full empty into the picking box, first throwing a loose sack into the box so that it will break the fall of the fruit. The basket being oval, one end is put into the box and then withdrawn, leaving the fruit in the box, and bruising is avoided. Some take the fruit from the basket by hand and place into the box. This is very safe, but time can be saved by my way, but care must be used. After the first basketful is emptied, the loose sack can be gently taken from under the lemons and used for the next. The size of picking boxes is immaterial. I use boxes that are twenty-four inches long, fifteen inches wide, and nine inches deep. Do not expose the fruit to the sun after clipping, and remove it in the boxes carefully the same day into the hallway of the lemon house. When clipping lemons do not leave a long stem, as in handling the stem will injure the fruit next to it.

HOW TO KEEP LEMONS.

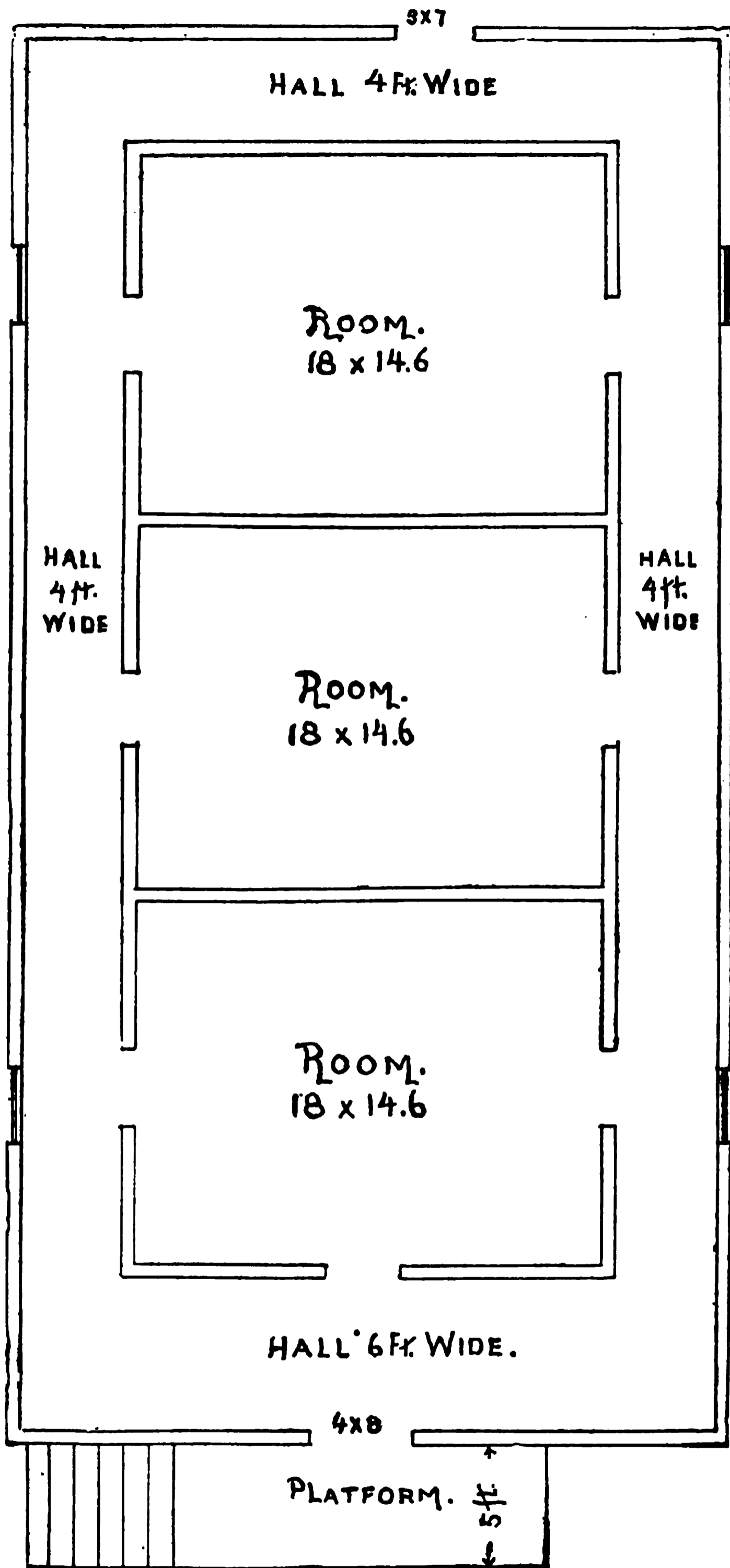
“We place our boxes of lemons in the hallway of the lemon house—if in early winter, on the south side; if in late spring or summer, on the north side, next to outside boarding of inside room. The main doors are kept closed and ventilators open, and the excessive moisture will evaporate from the fruit in about four weeks in winter months, and from two to three in summer; then put the lemons away. Now provide yourself with trays just the size of raisin trays, only deeper; the ends should be one and one half inches deep, and nail a lath on each side to keep the fruit from rolling out. I have utilized my raisin trays, and nailed one and one half inch pieces on the ends. Select one corner of a room, which, to prevent loss of space, could be made a little larger than is necessary, for a number of tiers of trays. Under each tier put a closed empty tray—or two would be better, as I find the fruit next to the bottom, as well as the top, cures faster and shrivels more. Upon this foundation put your tray for the first lot of lemons, which carefully empty from the picking box. It would be best to begin two tiers of trays at once, so that the lemons that are left over from filling the first tray with only *one layer* can be put on the second. Of course, throw out, as you come to them, all imperfect fruit. In this way build up your tiers of trays as high as you conveniently can, using your empty picking boxes for staging. Lastly, cover the top trays with one or two tight trays. In this way fill your room and keep your inside doors open for a few days; afterwards close through the day and open through the night, according to the moisture in the room, which should be kept comparatively dry. After the lemons are once put away on trays, and if they have been properly cared for before, and the rooms looked after as I have advised, there will be no need of disturbing them until wanted for packing, even if it is four, six, eight, ten, or twelve months after. A few will spoil, say from 2 to 10 per cent. Although the lemons at first touch each other in the *one layer* on the tray, they will contract so that if any spoil they will not often affect the next ones, and the few spoiling lemons will give a little necessary moisture to the air of the room. This is all. You can look in, from time to time, to notice condition. If a ventilator is put in ceiling of inner rooms, you will have to be careful of draughts, and perhaps use less door opening and closing.”

The lemon house is illustrated, and plans given to aid any one desiring to build a similar one, to which attention is called.

LEMON HOUSE AND PROCESSING ROOMS.

PERSPECTIVE VIEW SHOWING INTERIOR

LEMON HOUSE.



MAIN FLOOR.

The outside of all the rooms is boarded with tongued and grooved boards. The ceilings of all rooms are plastered—two coats—with rough plaster.

PART IV.

PROPAGATION, BUDDING, GRAFTING, AND
APPLIANCES.

assume the form of leaves, as shown in Fig. 1.

There are several requirements that should necessarily be observed, as the ones following, and they should not be lost sight of if one wishes to succeed in germinating apple seeds:

CHAPTER I.

GROWING SEEDLINGS.

APPLE.

Nurserymen and growers in this State have imported most of their stocks from abroad, rather than grow the seedlings, not because they cannot be raised here, but mainly on account of their cheapness. In France there are numerous orchards of seedling trees bearing common fruit. This fruit is sold there to the growers at very low figures, and the cheapness of labor and other conditions being equal, many have emerged into the business of raising seedlings for the export trade. These are sold there at rates ranging from \$1 50 to \$10 per thousand, according to size. Their cheapness, and the fact that they can mostly always be obtained in large quantities, has been quite an inducement to growers in importing them.

Apple seedlings are propagated from seeds obtained from various kinds of apples having an abundance of seeds, and while the windfalls and culls can be used for this purpose, it should be borne in mind that such fruit must be *matured* fruit, as the kernels in the seeds of immature or undeveloped fruit are generally only half developed, and only a small percentage grow, and those that do grow do not make thrifty stocks. It could not be expected that such stocks would ever become prolific trees. The well-ripened fruit nearly always contains plump seeds, and their producing a thrifty tree is borne out by the fact that the seedlings from such seeds are always the largest trees in the nursery or seed-bed, while those from half-grown, unripe, or undeveloped fruit generally remain small and very slender, requiring at least another year's growth before they attain the size of seedlings (of one season's growth) from plump seeds of ripe and developed fruit.

The apple seeds are planted in February or March, and germinate like the kernels of leguminous plants, such as beans, etc. The embryo expands and a radicle appears at the pointed end of the seed, which grows downward as the stem is formed upward. As instead of a spike being sent to the surface of the ground, and as the seed is thrust upward on the end of the stem through the soil, the seed should be covered with mellow earth or fine mold. When covered with stiff soil it becomes so compact that the stem cannot elevate the kernel to the surface. As soon as the seed appears above the surface the kernel separates into two equal parts, each portion being held by the stem, and the two lobes assume the form of leaves, as shown in Fig. 1.

There are several requirements that should necessarily be observed, as the ones following, and they should not be lost sight of if one wishes to succeed in germinating apple seeds:

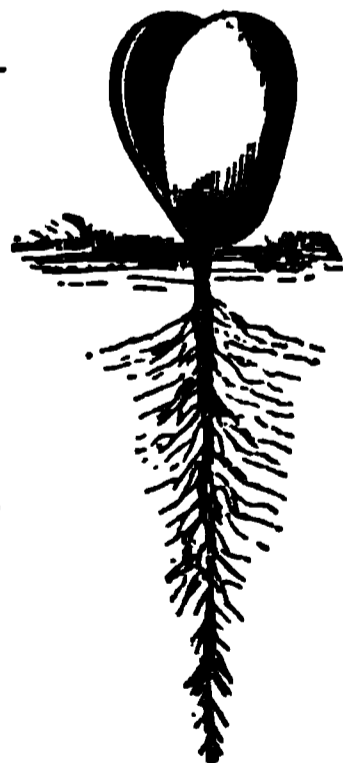


Fig. 1.

Seeds that have been allowed to become dry are put into a sack and then immersed in water, and allowed to remain therein (sack and all) for four or five minutes; the sack is then strung up to allow the water to escape. This operation is repeated several times for two or three days or till the seeds have begun to swell; then they can be planted, and the soil must not be allowed to become dry. In case the soil over the seed becomes dry before they germinate, it should be sprinkled with a fine sprinkler, and the extreme surface of the soil broken with a small four-toothed rake. However, great care must be exercised in not disturbing the seed; it is only the surface that requires this treatment to prevent it from baking. In the East they throw the seed, when it has been allowed to become dry, into boiling water, then turning quickly into cold water, repeating the process two or three times, until the hard shell is softened. Apple seeds that have been allowed to become dry, when treated in this way will germinate in a few days after they are planted. Great care should be exercised in the operation; it does not mean that they should be left in the water till the heat destroys their germinating power, but by a short, quick scald and sudden cooling, the heat does not have time to reach the germ.

Apple seeds when buried too deep, especially in damp ground, will soon mold and decay. The soil needs, therefore, to be put in condition essential for their germination.

After a season's growth the plants or seedlings are large enough to transplant into the nursery. The plants are taken up, and then assorted into sizes. Many will then be large enough to graft, which may be done indoors, as will be explained later on. The smaller ones, being quite slender, are transplanted in the nursery; they are then cut back close to the ground, and when they start to grow, several shoots will put forth, which are removed by hand rubbing or thumb pruning, and only one left, which forms the stalk. The rows are generally set five or six feet apart, and the plants four to twelve inches, according to the desire of the grower. The further they are set apart the larger the growth. By fall the stocks will be sufficiently large to be budded.

ALMOND; APRICOT.

Almond.—See method of raising walnut seedlings; also, peach.

Apricot.—See method of raising peach seedlings—the method is the same for the apricot.

CHERRY.

The seeds from the Black Mazzard cherry produce the best stocks for raising standard cherry trees. The raising of cherry seedlings is not very difficult, yet to be successful it requires considerable attention and the following of details closely. Cherry seedlings do not grow as rapidly as the peach or apricot, and the plants are seldom budded until the second year's growth. The fruit is collected when fully ripe and the pulp washed off; the pits are soon thereafter placed in boxes, covered with alternating layers of sand, and thus kept until spring, when they are planted in well-prepared seed-beds, or in nursery rows. If the pits, after being washed from the pulp, are to be shipped to a distance, they should be dried in the shade for a few days to prevent molding, but the drying process should not be continued too long, as exposure to air will

lessen or destroy their power of vegetation. Cherry pits start very early in the spring and should be planted in February, as soon as all signs of frost are over and the ground begins to get warm. The season following, the plants may be transplanted to permanent rows in the nursery.

Dwarf cherry stocks are not extensively used in this State, but in some sections they are preferred. For dwarf cherries the seeds of the Mahaleb are used, and the method of germination is the same as the one previously described for the Mazzard. The Morello stock is also considered very good, and even hardier. Dwarf species are somewhat difficult to bud into; the operation is most successfully performed late in summer, just as the stocks begin to relax in growth.

CHESTNUT.

For the method to be pursued in growing chestnut seedlings, see remarks on raising walnut seedlings.

CITRON.

The citron is propagated from seed and by cuttings. The seed is planted and treated in the same way as orange seeds. The plants grow more rapidly than those of the orange or the lemon, and the plants can be budded the year following. The citron grows and does well on orange stock, and this is the most profitable way to grow them.

Fig. 2.

French method of training the citron for the preservation of the fruits, as otherwise by their weight they would rest on the ground and sever from the limb.

The practice of propagating the citron by cuttings should be discontinued, because the citron roots are subject to the attacks of gum disease, and sooner or later the disease develops in the stocks, and the death of the trees is most certain.

FIG.

The figs grown in this State seldom contain fertile seeds—the kernel is lacking—and therefore their planting should be avoided. The imported figs found in our markets possess fertile seeds and nearly all germinate.

The figs are broken open with the hand and the seeds washed out in warm water. They are then spread out on a piece of paper or board for a little while to dry, or rather for the moisture to leave them. These are sown in April in well-prepared, shallow boxes, as follows: Take fine loam or mold and sift it, and with this mix one half sand; then fill the box two thirds full and press down with a piece of board; then on top scatter the seed and cover with the compost about one half inch deep. The box is then either put in the propagating house or under a frame. A very good way is to sink the box in the ground and place over it a piece of ordinary window glass the size of the box and raised on one side to allow ventilation. In watering, a very fine sprinkler or atomizer must be used, and the bed must be watered very little, just sufficient to keep the seed from drying; the soil below the seed will always be moist enough, especially when the box is sunk into the ground. When the seeds begin to come up there will also be weeds, but the fig plants are easily distinguished from them; the former are removed with the hand, not by pulling but by simply pinching them at the base, thus preventing the fig plants from being disturbed. The plants are taken out of the boxes after the first or second year's growth, and planted in nursery rows.

LEMON.

The lemon seed is planted, and receives the same treatment as the seed of the orange. The raising of lemon seedlings, however, is not practiced, because the stocks are subject to gum disease, and for this reason have been discarded. However, lemon stocks grown from seed make better trees than those propagated by cuttings. The roots are somewhat healthier, but neither are recommended.

The lemon is budded on the orange, and grows thriftily and becomes a prolific bearer. The orange stock is less liable to gum disease, and does not influence the top to any extent as to be noticeable in the fruit. At first the lemons will be inclined to be roundish, but as the trees grow older will assume their elongated shape. The orange stocks are much hardier, and more able to support the heavy weight of the fruit and foliage.

The lemon grows readily from the cutting. The cuttings are planted in early spring and through the summer. The smaller the cuttings the better, but they should not be too small. The wound in small cuttings soon heals over, and they make healthier trees than those from large cuttings, but in either case they are short lived and should not be planted.

LIME.

The lime is very easily propagated from seed. The seeds always germinate without much difficulty. The fruit is placed in tubs or barrels to rot, and then is washed out, preserved, and planted the same as orange seeds. The plants are transplanted the season following. The seed-bed or boxes must be well protected from frost, as the plants are very sensitive, and on account of their being so susceptible to frosts, the lime is not grown successfully excepting in warm belts and sheltered localities. The lime comes true from the seed, the seed "sport" only in exceptional cases.

OLIVE.

The propagation of the olive from seeds is perhaps the most difficult, for various reasons. The pits are quite hard and require sometimes two years after sowing to germinate. In Italy the growers soak the pits in a potash solution for two or three days, and it is said that when thus treated they germinate the same year in which they are sown. The practice in this State is to reproduce from cuttings, and no particular attention has been paid to raising the plants from seed. It is claimed by Italian and French authors that raising the plants from seed is the most natural system, and the one producing the most healthy and robust plants; but they admit that trees grown in this way require more time to bear fruit than those propagated from cuttings. Trees grown from seed seldom produce fruit in less than eight years, and furthermore, they must be budded or grafted, and they must be at least four or five years old before this operation can be performed.

The majority of the pits of the Mission olive do not contain kernels, therefore it is advisable to use the pits from any other variety having kernels. It is not necessary that the olives (from which the pits are taken) be of those possessing high qualities for pickles or oil, but it is important that the tree be of a thrifty sort. The fruits of the Redding Picholine contain perfect kernels, but the tree being a small grower it is not advisable to use this seed, as they may produce plants of a still smaller habit. The seeds having been freed from the pulp, are washed in water—containing some lye or ashes—to free them of all the oil adhering to them; they are then washed in clear water, and after drying in the shade are mixed with sand and put into boxes to be kept till the following spring, to be then planted. The sowing is done in February or March. The use of lye is necessary to render the shell of the pit a little less compact, in order that they may be penetrated by moisture. The lye roughens the shell and thus gives access to humidity.

As olive seeds do not all germinate the first year of sowing, it is advisable not to destroy the seed-bed until the end of the third year. The pits often continue to germinate in certain quantities for over two years.

The pits may be advantageously split, not by using a hammer, but always an iron vise. The longer part of the pit is placed between the jaws of the vise, and by closing tightly the screw the shell is split. It is not necessary to take out the kernel—on the contrary, it is better to leave it in the cracked shell.

The seeds are planted in March, in ordinary seed-boxes, with the bottoms perforated to admit of good drainage. The box is then filled with fine earth (sandy loam) to within three inches of the top, then a half inch of sand is spread, and on top of the sand the kernels are spread and covered with two inches of sand. The boxes should be kept moist and shaded for awhile. This method obviates the necessity of soaking the pits in lye to deprive them of their oily coverings, and a person can easily obtain some six hundred or more kernels in a day. The plants are left to grow two years in the seed-beds or boxes; they can then be transplanted in the nursery, and when large enough can be budded or grafted.

ORANGE.

The orange is very easily propagated from the seed. For this purpose windfalls, culls, etc., are used, but should be thoroughly ripe. The fruit is put into barrels to rot and the seed is washed out. A coarse sieve is used, the decayed pulp passing through the wire, leaving only the seed in the sieve. The seed of the orange should not be allowed to get dry after being taken from the fruit. The seed as soon as possible after being separated from the pulp, is either sown or mixed with sand and kept in boxes in readiness for planting. The seed can be sown in boxes or in seed-beds, which should be well prepared with fine soil or mold. The seed is planted thickly and broadcast, and covered with fine earth from one to two inches. The best time to plant orange seed is in March and April. If planted before March they have to remain in the damp, cold ground till the time of germination, and many decay. Orange seeds do not germinate until spring; it is, therefore, better to plant the seed when the ground becomes warm and all danger of frosts is over. The seed-beds should be kept moist but not too wet. The season following, the plants are transplanted in the nursery. The plants are taken up and assorted into sizes; the larger ones are planted and the small and slender ones are set in shallow boxes and kept another year, they being small, quite slender, and very delicate, are scorched by the sun when planted in open ground. The plants are set in the rows twelve to eighteen inches apart, and the rows six feet apart; this gives ample room for cultivation, and for balling the trees when digging them, when the time for transplanting to orchard comes. Planting close in the nursery tends to make slender trees. After the plants have grown a year in the nursery they may be trimmed, provided they have made good growth, say in February, and left to be budded.

PEACH.

Peach pits are perhaps the easiest to germinate, and almost any person can make a success in raising seedlings by observing a few of the most important rules applied to their propagation. The best seed, or pits, are from seedling trees, or, as they are termed, "natural fruit." The practice in this State is to buy the pits from driers and canneries, collected from all sorts and sources. The result is that a very large amount of pits is required, as only about one third (or even less) germinate. The cause of this is that pits from such fruit are generally defective, and many of the varieties sought for by the drier and canneries are subject to "splitting" at the pit, which do not germinate, the germ rotting after the pits are planted. There are many varieties of California seedlings having perfect seeds, but as the driers and canneries do not separate them the grower must take his chances in obtaining good pits from such sources.

Pits from seedlings, or natural fruit, are always the best; they are not subject to splitting at the pit and nearly all germinate, and the plants become the most thrifty stocks. It is contended, and justly so, that the longevity of the tree is dependent in a great measure upon the healthy condition of the seed. The seed of seedlings, or natural fruit, is more vigorous and most certain to germinate, and there can be no doubt that the trees will live longer when grown under such conditions. The

union of the two halves or valves of the pits of seedling fruit is very close and tenacious, while in pits of budded fruit it is often slight and imperfect. The kernels of pits from natural fruit are generally quite hard, close, and nutty, while in those of budded fruit they are often defective in form and the two halves frequently separate in handling. I am not aware of any orchard where trees of natural fruit are maintained for seed, and as the cultivation of the peach, principally of fine sorts, has been so much extended, natural fruit is not easily obtained.

As the growers will have to produce most of their stocks in the future, it would not be amiss for them to plant seedling trees, and maintain them for the specific purpose of producing seed.

The pits should not be allowed to dry after being taken from the fruit; they should immediately be put in sand or layered in the ground, to prevent the germ from drying. Often pits are planted that have become dry, and do not germinate the year they are planted, but will sprout the season following, if allowed to remain in the ground undisturbed. Great care should also be observed that the pits are not put in large piles after being taken from the fruit, but they should be spread out, to allow the moisture among them to disappear. Often they are put in large piles, and left in those piles for several days, during which time fermentation of the acid from the fruit takes place, and the germ of the kernel destroyed.

There are several methods in use for layering the seed. The most common one is to layer the pits in a well-prepared seed-bed in the fall. The place selected for the seed-bed should be in soil free from standing water during winter, as the seed is to remain until spring, and a superabundance of moisture tends to destroy their germinating power. The place where the seed is layered is marked with stakes, to indicate where to dig when the time comes for planting in the spring. A seed-bed is made ranging all the way from four to eight feet wide, and as long as one chooses. The earth is spaded away for a depth of six to eight inches, and the pits spread indiscriminately about four to six inches thick, and then the earth is spread on top, covering them for four to six inches. They are allowed to remain there until early spring. In some places they begin to germinate very early, and later in others.

Another method is by spreading the seed thickly about four to six inches deep, and then spading in about six inches deep. This completely mixes the seed, and it is covered in the soil. In either method the seed must remain in the ground until spring, when the shells are so far loosened that in handling they separate from the kernel. The kernels are at that time swollen, and many will be found sprouted. They are then ready to be planted in nursery, and care is required in their handling, as carelessness will break the tender roots of those sprouted. The planting of the seed in permanent nursery rows in the fall is also practiced, but is not recommended, as the seed does not come up evenly, and prevents the ground from being worked after rains, etc.

PEAR.

The remarks on the importation of apple seedlings apply to pear seedlings as well. Pear seeds are not so easily obtained as apple seeds, not because there are not enough pears produced, but because they are peculiarly liable to prove defective. Seeds gathered from the Winter Nelis

pear have, so far, given the best satisfaction here. Growers have reported repeated failures in having pear seeds from dealers germinate. This is, no doubt, because they are gathered from all sources, care not having been taken to prevent the germinating power of the seeds from becoming destroyed, in allowing the fruit to ferment before separating the seeds from the pomace; acetous fermentation takes place and the germ in the seed is injured by the acid. Another reason is that the seeds are extracted from unripe fruit, and are necessarily imperfect. Pear seeds are injured in many ways, but the principal ones are: being kept too moist for a long time, and by allowing them to become too dry. Pear seeds soon after being collected from the pulp should be separated from each other by mixing with sand. The seeds are taken from the fruit as soon as it becomes quite soft, by sifting them from the pomace, and before becoming dry, or immediately thereafter, are mixed with two or three times their bulk of sand, and are thus kept until spring to be planted. The seed should be planted in February or March, in seed-beds or in drills. After the first season's growth the plants are taken up and assorted, and then planted in nursery, or the larger ones may be grafted indoor, and then transplanted.

PLUM.

The plum used for stocks can be propagated in two ways, *i. e.*, by planting the seed and by cuttings. There are several varieties of plums that can be used for stocks, but the Myrobalan, or cherry plum, has proved the best adapted as a stock for plums and prunes. There are other varieties that can be used equally as well, were it not that they put forth numerous suckers, so much so as to render the stock in time valueless. The Myrobalan plum does not sucker, and thrives in moist soils which are heavy and hold the moisture too long for other stocks, such as peach, apricot, almond, etc., to thrive. It also thrives in dry soils, but it is best adapted for heavy soils, such as are suitable for the pear, or in situations which are too wet for other fruit trees. However, many have fallen into the error, because this stock is so enduring, of planting it in soils too poor to be altogether suitable for its culture, and on this account the trees have not reached perfection or become profitable bearers. This tree, as do all others, requires the elements and conditions suitable for its culture, but will endure many more hardships, and where the better conditions are supplied its returns are according.

Plum pits are kept in sand until spring, when they are planted either in seed-beds or in drills.

QUINCE.

The quince is readily propagated, either by planting the seed or by cuttings. The latter method is, however, mostly practiced, it being accomplished so easily. The seed should never be allowed to get thoroughly dried before it is planted. As soon as taken from the fruit it should be preserved in moist sand until spring, when it is planted in a well-prepared seed-bed, or it may be sown in drills, as pear and apple seeds. Quince seeds are not very easily obtained, as the fruit is not grown in such large quantities as the apple and pear to afford the gathering of culls, etc., from which to extract the seed. The fruit, if obtained, must be cut to extract the core in which the seeds are. They

cannot be left to rot, as are apples and pears, as decay sets in too slowly; and while many quinces commence to rot very soon, yet one side generally remains intact, and to wait until that part decays would be too long for the seed to remain in the mass of sour and fermented pomace, which destroys their germinating power. Propagating by the cuttings system has so far been the most practiced, and almost exclusively.

The system of multiplication by cuttings is probably the best for the quince. The cuttings grow very readily and make thrifty growth, and can be budded the same year of planting. The cuttings are taken from the trees early in the fall, and are planted in January or February, or even later, but the sooner they are planted the better, as the quince puts forth quite early. Large cuttings take root equally as well as the small ones, but the small ones are preferred, as they make a thriftier and healthier stock. Large cuttings have the disadvantage of requiring at least two years of growth for the formation of a complete root system. Often a large cutting is taken up the winter after planting with the end only partly calloused, and the part where rootlets have not begun to form generally dries or rots away, the rootlets then only forming on one side of the cutting. In small cuttings a root forms at the end, and the cut soon grows over; the small root pushes its way downward, and throws out numerous laterals, which give the cutting a system of roots equal to trees grown from seed. The cuttings are made twelve inches or shorter, preference being given to those measuring from one quarter to one half inch thick, and twelve inches long. They are planted deep, allowing only about two inches of the cutting above ground, and after the soil is well pressed around them the loose soil is hoed against the cuttings on either side, covering the parts exposed to prevent the sun from scorching them, and thereby causing the ends to die back. When the cuttings put forth, the little shoots make their way through the loose soil. It is better to allow all the shoots to grow undisturbed for a time, as the trimming prevents the development and formation of roots. Generally a cutting puts forth several shoots, and in a month or so the most of them seem to stop growing, while one or two take the lead and keep on growing; these are the ones to leave, and which become the stock. When those shoots are seen to take a start ahead of the rest the others can be shortened, but should not be cut off entirely, as they aid materially in keeping the sap flowing, acting as suction forcing the sap to the shoots. If the suckers are removed too soon this may give the cutting a too sudden shock, and check its growth for the season. In such event the cutting might as well be pulled up, as it will only remain in the ground lingering between life and death, and, if allowed to grow, will never make a thrifty tree.

Layering, which is a very simple operation, consists simply in bending the limbs down and covering them with earth for a season, and cutting from the parent the season following. When the limb is bent down it is always advisable to cause it to partly break, or twist it; this will help in the rooting. The bark is sometimes cut nearly around the layers just below a bud, to induce the formation of a callous, from which roots are emitted. Quince trees when grown bushy put forth numerous shoots near the ground, thus affording a good opportunity to put down layers. The best time for layering is in the spring, before the trees begin to start.

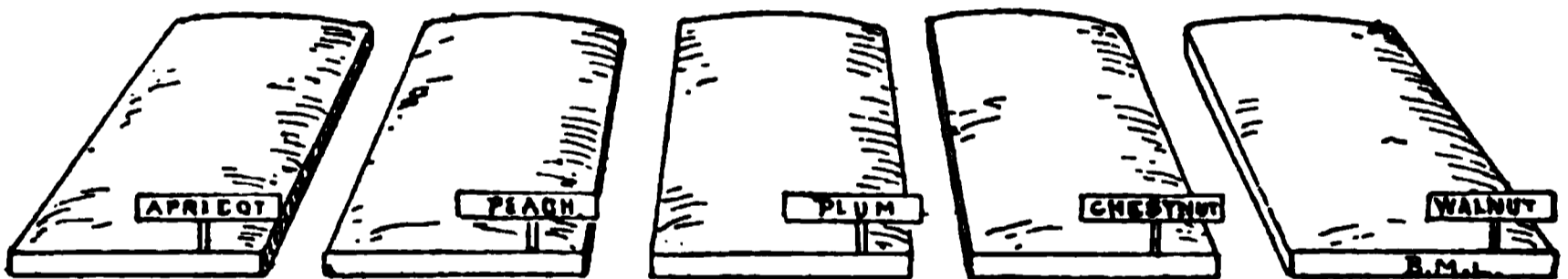
WALNUT.

The growing of walnut seedlings is simple, but requires care and attention in all the points bearing on their germination. The nuts are placed in sand, preparatory to planting, as follows: A frame consisting of ten-inch boards is placed on the surface of the ground and half filled with sand. The nuts are then spread thickly (a layer of nuts six inches deep), and covered with about three or four inches of sand. An embankment of earth is made all around the frame to prevent the nuts from drying. The nuts are examined from time to time, and as soon as they indicate or show signs of germination are planted in nursery rows.

LATH PROPAGATING HOUSE.

For the germination of apple, pear, orange, and other seeds, there is nothing better than a lath house, a good idea of which may be had from the illustration. The laths are one half inch apart, giving the plants enough light and air, and at the same time preventing the ingress of birds, etc., which scratch up the seeds, especially while sprouting. They can be made of any size, and the seed-beds, which consist of frames sunk in the ground, are not only used for the growing of seedlings exclusively, but also for starting cuttings of different kinds.

SAND-BEDS FOR SPROUTING PITS, NUTS, ETC.



The method of preparing sand-beds for sprouting peach, apricot, plum pits, nuts, etc., is shown in the above illustration. The frames are made of twelve-inch boards set on edge, and of any size desired, and rest on the ground. They are partly filled with sand, upon which a deep layer of pits or nuts is placed, and covered with sand. The sand is kept continually moist, yet not too wet, and in case of lack of rains is watered. The seed is examined from time to time, and as soon as it commences to sprout is taken out of these sand or sprouting beds and planted in the nursery.

LATH PROPAGATING HOUSE.

CHAPTER II.

BUDDING.

The process of budding is performed during the growing periods of the various kinds of trees. The peach, cherry, almond, apricot, plum, etc., are budded as soon as the cions, or buds, have developed or matured in the spring or midsummer, and if budded early they can be started the same season, but if budded late they have to be left dormant through the winter. The apple, pear, quince, etc., are budded in the summer, and as they do not grow as rapidly as the peach, almond, etc., they are left to lie dormant till the following spring, when they are started. The



Fig. 1.

A. The point which should not be used, as the buds are generally blind. *B.* Point from where the buds are developed. *C.* Beyond this point the buds are too tender, and should not be used. *D.* Indicates the cion, or budding stick, to be used, being between points *B* and *C*. *E.* The cion, or budding stick, trimmed ready for budding.

orange, lemon, lime, citron, etc., are budded all through the summer, from early spring. The best time, however, is just as the sap begins to rise. The buds at that time "take" more readily, and the growth is undisturbed through the growing period of the tree. The fig, walnut, chestnut, etc., are budded during the summer and the buds left to lie dormant, to be started in the spring. The olive and other evergreen trees of this kind are budded from the time the sap begins to rise in the spring until late in the fall. If budded early they are started and make good growth the same season. If budded late they must be left to lie dormant till the spring following, when they are started.

BUDDING THE PEACH.

The budding of the peach is perhaps the most simple; the buds take more readily, and less care and practice are required than in budding other trees. The first important factor is the selection of cions, or buds. The illustrations (Fig. 1) furnish a good example of the budding sticks and the method of preparing them for budding. The budding sticks or buds having been prepared, they are placed in a box and covered either with wet sacks or moss. In taking them to the field, it is advisable to never allow the sun to strike them. A small, shallow box, with a layer of wet moss at the bottom, on top of which the

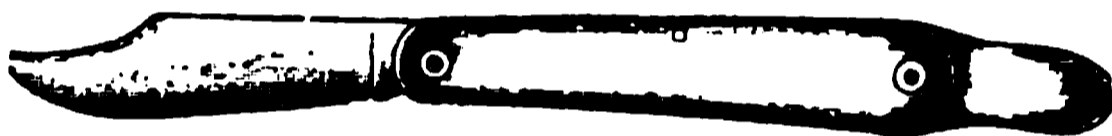


Fig. 2.

buds are placed and covered with a wet burlap sack, is much preferred. As the operator proceeds, only one stick is taken out and used at a time.

The operation is performed with a sharp knife, called "budding knife." Fig. 2 represents a favorite style with me, and is called the *Saynor*; there are others that are also very good, such as the *I X L*, or *Wostenholm*.

A vertical incision is made in the bark of the young tree by simply pressing the point of the knife against the bark and drawing it up, making a cut from about one quarter to one half of an inch long; then by placing the knife transversely, and with a slight twist of the hand from left to right, the transverse cut is made (Fig. 3). At the same time the edges of the bark become loosened, so as to easily admit the bud; then by pressing the bud it will work its way downward in the slit until it reaches a firm position, and the bark covers it tightly. The buds are then tied firmly with good, soft cotton twine, and left in that position until the time comes for the strings to be cut, or the buds started or left to lie dormant, as will be explained later on.

The cutting of the bud from the stick becomes an important factor. The bud should not contain too much wood, and should not be cut so thin that when tied it is squeezed into nothing. For this reason it is always advisable to use large and plump buds. The stick is held firmly with the left hand and the bud cut with the right, as shown in Fig. 4.



Fig. 3.
A. The stock. B. The transverse cut. C. The vertical incision.



Fig. 4.

A. The cion, or budding stick, showing how the buds are cut, and the position in which the knife is held. B, C. Points indicating the length to cut the buds.

NOTE.—These illustrations show how the buds are cut with the point of the bud upwards, but they may be reversed if the operator so chooses.

The bud is then inserted in the slit or incision, as shown in Fig. 5. The bud is then tied; for this purpose good, soft cotton twine is the best. The work can be done more expeditiously and the results will always be



Fig. 5.
A. The stock. B. The bud inserted.

Fig. 6.
A. The stock after budded. B. The twine as tied.
C. The tie at the finish. D. The tie at the beginning.

more satisfactory than when other materials, such as cloth strips, etc., are used. Many tie differently from others. Some prefer to commence the operation by wrapping the twine below the bud first, and wrap until the top is reached. I much prefer to begin the wrapping above the bud and finish at the bottom. It is of great advantage, because the bud will not slip while being tied, and it is kept in position, and instead of allowing it to slip or relax, drives it down further into the slit, and in this way a most perfect fit is obtained. The principal and most important part of the operation lies in tying the buds well, for if they should be tied loosely the air gets between the bud and the inner bark of the stock, causing the sap between them to dry and preventing adhesion.

If the weather is favorable the strings can be cut in fourteen days. In case there should be a continuance of heat it is better to leave them undisturbed for another week, because the heat sometimes causes the bark to open and the buds to dry out.

In the summer young peach trees grow very rapidly, and sometimes the strings will cut into the bark, and in this way many buds are lost, therefore they should not be neglected, and the strings should be cut at the proper time. It is always advisable to insert the buds pointing one way—in the direction of the rows—so that in searching for those that miss, in rebudding, or in cutting the strings, a person need not spend time in searching to find them.

STARTING PEACH BUDS.

The most important point after budding is the starting of the buds. When the plants have been budded in early spring (June) they can be started, and the buds, if properly attended to, will become salable trees

Fig. 7.

A. The brush left on the stock to induce the bud to start, by acting as suction—drawing up the sap. *B.* The stock. *C.* Point where the bud may be tied to protect it from breaking. *D.* Point where the old stock is to be cut away, the dotted line below it indicating how much the bud is endangered by cutting lower than this line.

by winter, known and designated as June buds. The starting of a June bud requires care, as the trees are young and full of vigor, and brittle to a certain extent. If the tops of the stocks are cut entirely off, as in

starting buds in the spring, the shock to the stock is too great and will stop the immediate flow of sap, and the tree will die. The best way is to bend the tree over, and by giving it a twist the stock will crack about the center, say about ten or twelve inches above the bud; this will give the stock a slight shock, although so slight as not to disturb the flow of sap, and at the same time induce the bud to start. When the buds start and have made a growth of three to four inches the main stock is cut away about eight inches above the bud, but should not be cleared of all the brush, as the stock may die back and endanger the buds. It is always better to allow a little of the brush to remain, as shown in Fig. 7, at *A*.

After the bud has made a growth of a foot or more the stocks are cleared of all brush, and the stump may then be cut back, but it is better to leave it until fall.

Fig. 8.

A. The stock trimmed of all growth. *B.* The point where the bud was inserted. *C.* The point where the top was cut off to start the bud. *D.* The bud started.

With buds that are let go and lie dormant, the operation is somewhat different, and does not require the attention given to starting June buds. In February the stocks are cut back about from four to six inches above the bud; then all the brush is cleared away and the nursery cultivated. Nothing then remains to be done but to wait for the buds to start, and with them there will be numerous suckers, or shoots, that have to be

removed from time to time. These are removed by hand-pruning, they being very tender break at the touch. When the buds have made a growth of about a foot or over, they take the entire flow of sap from the stock, and therefore suckering becomes less necessary. The buds may be tied to the stock, so that they may make a straight tree, but this is seldom practiced, and is only done where trees are not grown extensively, as the buds grow remarkably straight in the nursery.

SPRING BUDDING.

In this method the tops of the stocks are not removed, but are left undisturbed, so that when they leaf out the bark may slip easily, otherwise it will become tightened so as to prevent budding at this time. Peach seedlings generally leaf out early, and buds inserted at this time grow and make large trees by fall. As soon as the bark separates from the stock the buds are inserted in the ordinary way. Three weeks after the strings are removed and the tops cut back to force the buds to start, the same as in June budding. The cions or buds are from wood of the previous season's growth, and are gathered early and kept with the larger ends in moderately moist sand in a cool place. This prevents them from starting, and they can be kept until late in the spring.

BUDDING THE ORANGE.

The best time to bud the orange is in March and April, just as soon as the trees begin to show signs of growth. The sap is then rising, and if budded at that time almost every bud will take, and in less than a month will start. It is best not to cut the entire foliage of the stock when starting the buds; a little should be left to keep the sap in the stock flowing, and induce the buds to start. Summer budding is performed in July and August, but the buds do not then start even, and as many start so late the growth by winter is quite tender, and the trees are liable to be nipped by frosts.

The selection of the buds is very important, and only the best should be chosen. When weak and immature buds are inserted they often remain dormant in the stock a year before starting. Buds to be left to lie dormant are put in as late as possible, but before the stocks begin to relax in growth, to prevent them from starting at that season and the bark growing over them.

STAGES OF BUDDING CITRUS TREES.

The different stages of budding the orange, lemon, lime, citron, etc., are as follows:

The selection of proper buds is a very important factor, Fig. 9 illustrating the kinds of cions or buds to select.

First—The vertical incision in the bark, and the position in which the knife is held. (Fig. 10.)

Second—The transverse incision. (Fig. 11.)

Third—The opening of the bark by a slight twist of the hand from left to right. (Fig. 12.)

Fourth—Cutting the bud. Fig. 13 shows position of the hands and

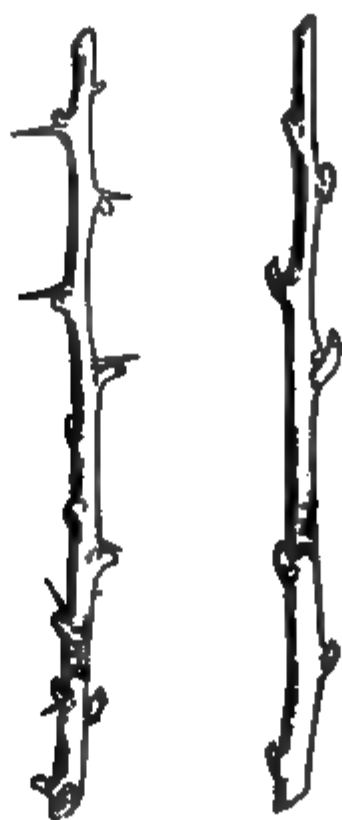


Fig. 9.

Thorny lemon bud. Thornless orange bud.

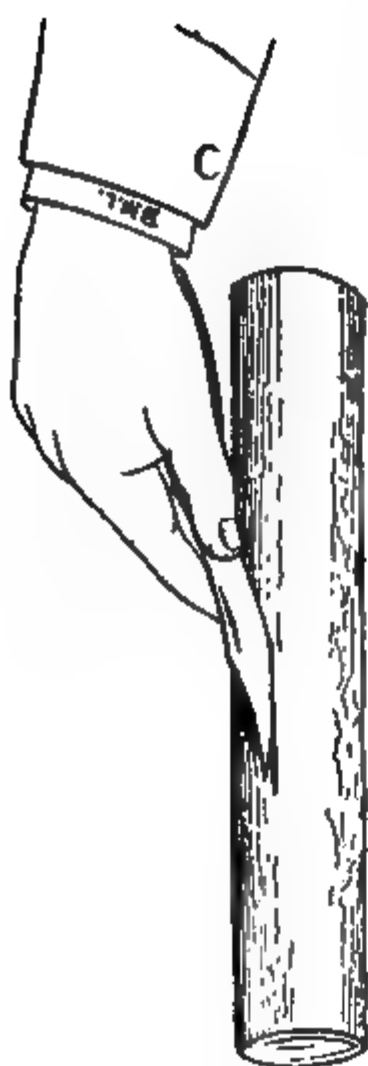


Fig. 10.

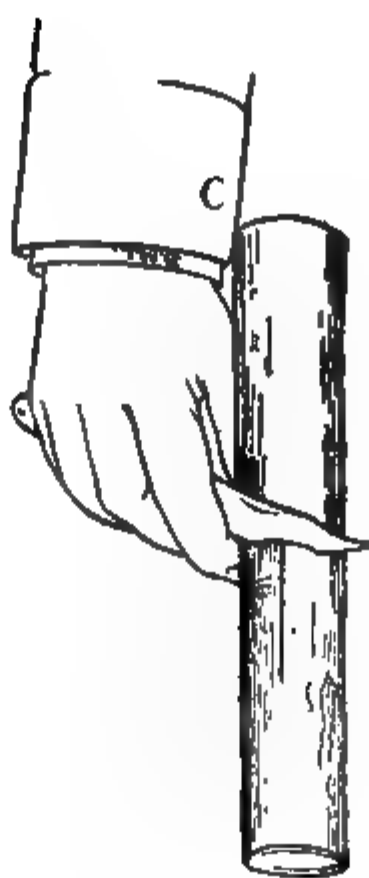


Fig. 11.

Fig. 12.

knife, and the point of the buds downward. In this way the buds are cut cleaner and much sharper, and do not crack in cutting.

Fifth—Bud inserted. (Fig. 14.)



Fig. 13.

Fig. 14.

Fig. 15.

Sixth—Bud tied; operation complete. (Fig. 15.)

In these latter figures (Figs. 14 and 15) the method of cutting back the stock to start the bud is shown, and the portion of brush and leaves left remaining, to prevent a check in the flow of sap, which are removed later, when the buds have made a start of two or three inches, at the point shown at *a*.

APPLES.

Budding apple seedlings is not a difficult operation; that is, it does not require so much skill as do other trees. The operation is performed during the growing season, generally in August and September. The incision in the stock is made in the same manner as described for the peach. The buds are cut from a shoot of the current season's growth,

about an inch and a quarter long—a half inch above and three quarters below—as shown in Fig. 16, and inserted under the bark of the stock in an incision previously made, as is shown in Fig. 17, and is then tied with cotton twine; for this purpose sixteen-ply is most preferable. In three weeks the twine is removed, and if the bud has "taken," it is left to lie dormant until the spring following, when the stocks are cut back (in March) to force the buds to start. It is very necessary that the stocks be making growth, so that the bark may slip easily, otherwise the

Fig. 16.
The bud as cut
from the limb.

buds will not "take" so well. It is also very important that the operation be performed at the proper time; if performed too early, when the stocks are in a thrifty growing state, the formation of new wood will surround and heal over the wound or incision made in the stock, covering many of the buds, and many, instead of remaining dormant, will start, making only short, willowy shoots, which in spring start late, and do not make the best of trees. The stocks should also be budded before they have ceased to grow, because then the bark tightens, and a bud that has to be forced under the bark often fails to "take," and those that fail cannot be again budded that season—the time for successful operation having passed. The growth of the stocks should be watched, and the stocks budded before they have ceased to grow; but by this it must not be inferred that very early budding is preferable, excepting when the buds are to be started, to make what is commonly called June buds. Stocks finishing their growth early in the season are budded early, and stocks that grow until autumn are budded late. The buds must be perfectly developed. Undeveloped buds remain dormant in the stocks and do not start even with the rest, and as they do not start until they have developed, sometimes not until late in summer, they make but very little growth the first season. For early spring budding, the maturity of the buds is hastened by pinching the tips of the shoots of the trees from which they are to be gathered, the buds being taken from the trees just before they start the second time. In this way a soft shoot is made to harden, and its buds are fit for early budding in ten or twelve days. If a considerable quantity are wanted, they are stripped of their leaves and packed in moss or wrapped in dampened sacking immediately after being cut, and put away for future use. They can thus be kept for two or three weeks.

Fig. 17.
Bud inserted.

ALMOND, APRICOT, CHERRY.

Almond.—See method of budding the peach; it is the same for the almond.

Apricot.—See peach—the same for apricot.

Cherry.—The method pursued in budding the cherry is very similar to the method employed on the peach. Mazzard seedlings, for standards, are budded in July and August, and left to lie dormant through the winter, to be started in the spring following. Morello and Mahaleb seedlings, for dwarfs, are best budded in August. They are somewhat more difficult to make "take" than the Mazzard, and the operation is best performed when the stocks just begin to relax in growth.

CHESTNUT.

The chestnut is very successfully budded in the summer during the growing period of the stock. The following illustrations show the size the bud is cut, the cut in the stock, and the bud as inserted and tied:



Fig. 18.

A. The stock showing the incision made to receive the bud. B. The bud, showing the size of same, and manner in which it is cut. C. Bud inserted, showing method of ligature.

The slit or incision in the stock is made first, then the bud is cut from the budding stick and immediately inserted into the slit or incision in the stock, and tied tightly with soft cotton twine. In three weeks the strings may be removed and the buds left to lie dormant until spring, when the tops of the stocks are cut back in March to force the buds to start. The operation is best performed in August, when the stocks are making growth, and better still when they are just hardening the growth in the latter part of August. The chestnut is also budded successfully by the ring method, as described for the fig.

CITRON.

See method of budding the orange; it applies to the citron also.

FIG.

The fig is perhaps the most difficult tree to bud. The milky substance that exudes from the limb or bark seems to sour and poison the sap when it comes up from the stock, and prevents the bud for uniting, and for this reason the methods of budding as employed on the peach, pear, etc., cannot be used on the fig. For the fig the best method is to cut a



Fig. 19.

A. The stock prepared. *B.* The bud.

ring right around the stock, as shown in the figure at *A*, say from three fourths of an inch to an inch long. Then another ring of bark is taken from a limb (the cion), of the same size, having the bud wanted, as shown in the figure at *B*; this is then slipped into the cut in the stock, and bound tightly with the soft cotton twine or cloth, covering it up to exclude the air. By this method the ascending sap will unite with the sap of the bud. The operation should be performed in August or September.

LEMON AND LIME.

Lemon.—See method for budding the orange; it is the same for the lemon.

Lime.—See method for budding the orange; it applies to the lime also.

OLIVE.

Budding the olive by the ordinary methods is somewhat difficult. The methods herein given are the most simple and the most practiced. The plate bud is the one most largely used. This is one of the most simple of all methods of budding the olive, and can be operated on small and large trees. A cut is made on the stock, thus \square , and the flap drawn down. The bud is then cut from the cion to be a little smaller than the space cut in the stock; it is then inserted, as shown in Fig. 21. The bud consists of only the bark and an eye. At every leaf there is a bud, and the bark being cut around it, separates very easily from the wood. The flap is then turned up, covering the bud entirely, and is tied tightly with good, soft cotton twine. In three weeks or a month the strings must be removed, and girdling the tree about an inch or two above the bud will induce the bud to start. After it has commenced to grow well the top of the tree may be cut away a foot above the bud, and the bud trained to the stock.



Fig. 20.

Fig. 21.

Fig. 22.

Fig. 20. A. Incision (ordinary budding) in the stock. B. Plate bud. C. Bud inserted and tied.

Fig. 21. Plate bud inserted; front view, showing flap, which is turned upwards and then tied.

Fig. 22. Bud inserted and covered with the two flaps from above and below, and is known as the "H" method.

Another very simple operation consists in making a cut in the stock in the form of an H; the flap is then drawn both ways, up and down, from the center cut, and the bud inserted, the flaps protecting both ends of the bud, as shown in Fig. 22. This method has the advantage that large buds, having a large bulge at the leaf part, can be used, while they cannot in the single-flap method. The other figures (Fig. 20) show how the buds are removed and inserted by the ordinary plate method.

The twig bud is also very simple, but requires more skill and care.



Fig. 23.



Fig. 24.

Fig. 23. Twig bud, showing how it is trimmed and removed from the branch.

Fig. 24. A smaller twig bud, showing how the wood in the bud is gouged out.

By this method the cut is made deep into the wood to give the bud sufficient bark, as most of the wood in it is afterwards removed. The leaves are partly cut off, leaving at least a half inch of the leaf on the bud to prevent the bud from drying; then, with the sharp point of the budding knife, the greater part of the wood inside of the bud is removed,

as shown in Fig. 24. If part of the wood is not removed then the bud cannot take, as the wood in it prevents it from uniting. The bud is then inserted into the stock, as in the ordinary way, and tied tightly. In three weeks the string is removed, and part of the top of the stock is cut back to force the bud to start. As the bud grows the foliage of the stock is gradually removed, until the bud is able to take up the entire flow of sap; it is then left to grow. This process is performed at any time of the year when the sap flows freely. Best results are, however, obtained when the buds are inserted early in the spring of the year, as the operation can be performed to a much better advantage, and the buds will grow to some height before the winter months set in.



Fig. 25.

The bud severed from the stick.

PEAR.

The pear is budded in the same way as the apple, and the operation is performed in like manner, excepting that the buds are cut sharper and not so long. Pear seedlings may be budded in July or August. The cions are taken from the trees of the current year's wood, the leaves trimmed off, and the bud inserted in the same way as the apple. Fig. 25 shows how the buds are trimmed of their leaves, and the size cut from the limb. The buds are cut all the way from three fourths to one and one fourth inches long. Point *a* (Fig. 26) shows the length cut above the bud, and point *b* the length below it.

PLUM.

The plum is budded during the months of July and August, and in some localities the stocks begin to relax their growth quite early; they should, therefore, be watched and budded before the bark tightens. The method for the plum is like that for the pear, and is performed in a like manner. Fig. 27 represents how the bud is cut from the stick, and the length. Many prefer to remove the wood in the bud, as they take better, but this is not necessary when the knife used is quite sharp and properly tied. For time of cutting back, starting the buds, etc., see pear, peach, etc.

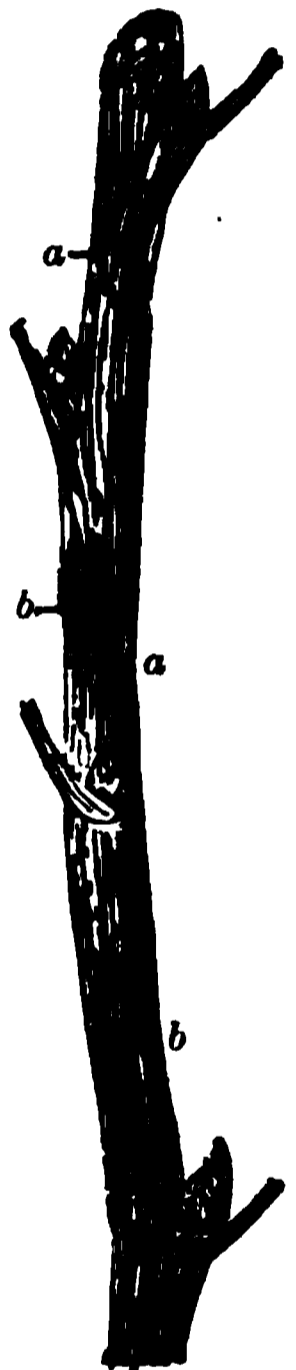


Fig. 26.

Budding stick, showing the size buds are cut.

QUINCE.

The system as explained for budding the pear will suffice for the quince.

WALNUT.

The walnut is budded very successfully by the following method: The bud is cut, as shown in Fig. 28, about one and one half inches long. The cut is made deep into the wood, the object being to give the bud as much bark as possible. The wood of the bud is then partly removed; it is gouged out with the sharp point of the budding knife, as too much wood in the bud prevents a proper union. The bud is then inserted

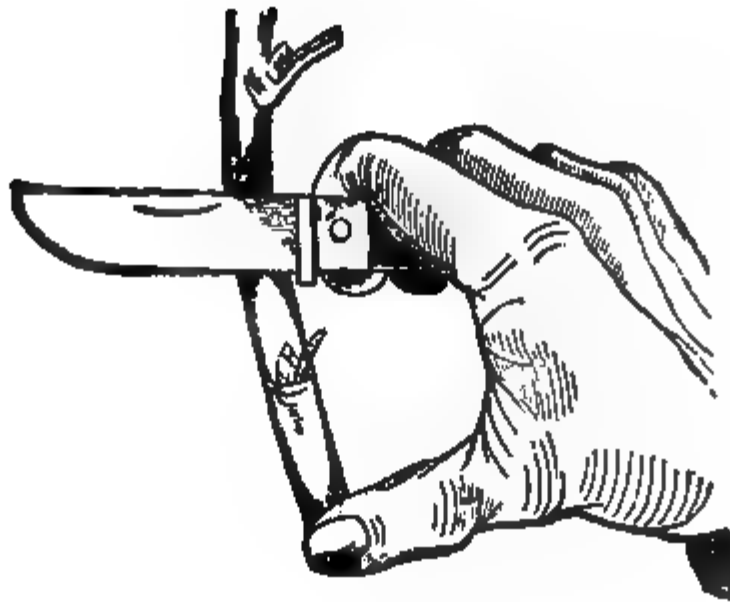


Fig. 27.

Fig. 28.

Fig. 29.

Fig. 28. Size of bud and how cut.

Fig. 29. Transverse view of the bud, showing how the wood, and how much of it, is gouged out.

into the incision made in the stock, the same as ordinary budding is done. The bud must then be tied tightly with heavy budding twine. In three weeks after the bud has been inserted the twine may be removed, and the bud allowed to lie dormant until spring. The walnut does not put forth until late in the spring, therefore the stocks are not cut back till then. As soon as the buds of the stocks begin to swell, the stocks are cut back and the inserted buds allowed to grow. Great care must be exercised not to cut the stock so close to the bud as to endanger it. The buds are allowed to grow at will until they become hardy, then they are trained to the stock, the object in view being a straight tree. The operation is performed in July and August, when the tree is making its growth.

CHAPTER III.

GRAFTING.

The objects of grafting are the same as budding, but the operation is performed at a season when the stocks have ceased to grow and have become dormant. There must always be taken into consideration the fact of the cion and the stock being of close alliance.

There are a great many grafting methods in use, but the most easily performed and the most generally practiced in this State are the cleft and the whip graft.

The cions (shoots of the previous year's growth) are cut in early winter or at any time after the fall of the leaves, and preserved by burying the lower ends in earth in a cool place, and are thus kept perfectly dormant for future use. It is very important that they be kept in a moderately moist earth or sand, not too wet, as they will rot. In the selection of cions the most important point to be observed is the selection of proper wood, that it be well ripened, from healthy, vigorous trees.

GRAFTING TOOLS.

Knives.—For grafting trees in nursery the only tools necessary are a grafting knife, a knife for facing the cions, and a waxing pot and brush. It is best to have two knives, because if only one is used it becomes dulled in use on the stock and unfit for facing the cions properly. For this purpose I prefer a common pruning knife, as shown in the figure, which should always be kept well sharpened. These are found on sale

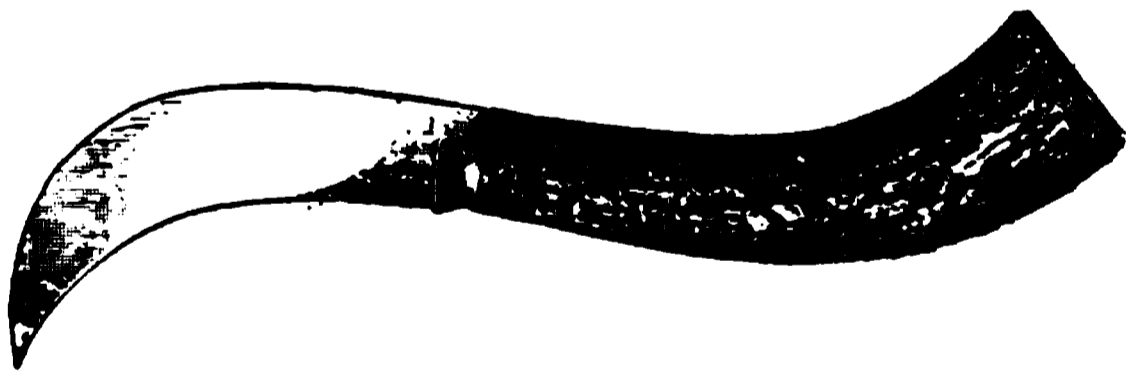


Fig. 1.

with different kinds of handles. I much prefer the *buck* handle, as it is rough and never slips from the hand while using. The knife for facing or preparing the grafts should always be kept sharp, and if it is only used for facing it does not require wheting often. For facing, the budding knife called I X L, made by George Wostenholm, Sheffield, and having a stout, black handle, has always given the best satisfaction, and is preferable for this purpose. If the stocks are small the facing and splitting are best and most expeditiously done with the latter knife.

Saws.—It is always best to have sharp tools with which to cut those stocks which are too large to be cut off with a knife. Cutting them with shears should be avoided; instead, they should be sawed off with a fine-

toothed saw. This is especially required on stocks too large to be whip grafted. Fig. 2 represents a common bow saw—a home invention—yet it gives the best satisfaction. In this the handle fits closer in the hand than many others of this class. Both ends of the blade are fastened by means of a little screw onto a bolt, having the other end riveted into a counter-sunk hole, the upper one with a thumb-screw nut, also revolving in a counter-sunk hole. The blade can thus be turned at any angle, or it may be kept in one position by tightening the thumb-screw at the end near the handle. Two small pieces of wood are riveted on either side of the bow at the lower end, which serves as a handle, to prevent injury to the hand. The bow is made of steel, and springs a little. These saws can be made by any one, and, for cutting large limbs, have no equal, as the blade being thin and narrow, and the teeth set wide, will cut through a limb with great rapidity without sticking or getting pinched in the cut, a difficulty met with in all other saws. The blade may be reversed, if one chooses, and made to cut by drawing it instead of shoving; in this way they are not so easily broken.

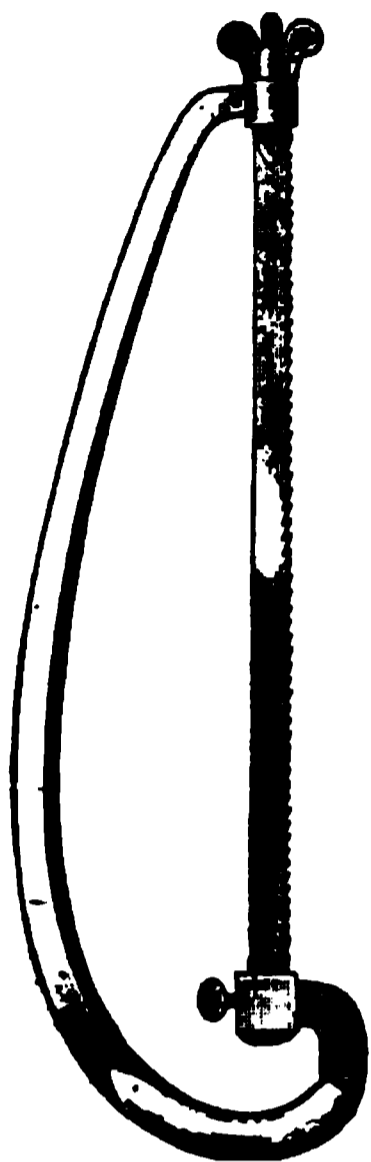


Fig. 2.

Fig. 3 is another home pattern, this one having a handle about sixteen inches long, and the blade guided by it. In using it the handle and bow are grasped together by the hand, which sometimes is very awkward, especially when large limbs or a considerable number have to be cut. In any case it is more tiresome to the hand than that shown in Fig. 2.

A saw called the "California Pruning Saw," constructed on the same principle as Fig. 3, is also a desirable one. The blade is fastened by pegs at each end, which drop into slots, and the blade is tightened by the turn of the handle. The only advantage it has over the others is that the blade can be changed in position without having to remove screws, etc., but this is of very little consequence.

A very good saw is made by simply taking a branch of a tree, such as orange, locust, or any hard wood, in which a hole is bored through at each end; this must then be bent into a bow, the bolt at either end of the blade passed through, and the nut screwed on. In this way all that is required is the blade and the bolt fastenings.

Chisel and Mallet.—For grafting large stocks a chisel and mallet like Figs. 4 and 5 are required. The chisel can be made by any blacksmith from an old file. The point or hook at the end is used to keep open the split for the insertion of the graft. The mallet is used to tap the chisel in splitting stocks. These are made from any kind of hard timber; a piece of locust wood answers the purpose very well. A block, either round or otherwise, is bored in the center, and a handle driven into it, and at the other end (which passes



Fig. 3.



Fig. 4.



Fig. 5.

through) a peg of wood is driven, to prevent the handle from becoming loose. Mallets found in stores do not, as a rule, give as good satisfaction as one of these home-made contrivances.

OPERATORS REQUIRED.

In grafting a considerable number of stocks in the nursery it is best to have three men perform the work, as follows: A to cut the stems off and make the incision in the stock; B to follow A, and insert the cions; C to follow B, and wax the grafts. And still better, if another man is added, to face the grafts and supply B with them, so that B may keep close pace with A in inserting the cions into the stocks as soon as cut; C follows B closely and waxes the grafts, using for this purpose waxed paper. The paper is first waxed, and then cut into strips. He carefully wraps a strip of this paper around the graft, and by pressing all loose points the waxed side adheres perfectly.

WAXING POT.

Fig. 6.

Where waxed paper is not used, grafting wax is prepared, and the grafts waxed with a brush. For this purpose a grafting wax pot must

be used. The one shown in Fig. 6 answers the purpose quite well, and is perhaps the most convenient to use.

The wax is first prepared in another utensil, and when cool is broken up into pieces; these can be carried to the field in a box or sack, and kept to supply the pot whenever required. The pot consists of what is called a "glue pot," and can be found on sale in most all hardware stores. Water is first placed in the pot, and then the can containing the wax is let down into the water, and the lamp, which has been previously filled with coal oil, below lighted, and in this way the wax never gets too hot to apply, neither is there any danger of it burning by the pot getting overheated, as it does when the flame plays directly upon the receptacle containing the wax.

GRAFTING WAX.

There are various formulas for making the wax, but the most common in use consists of rosin, tallow, and beeswax, in the following proportions:

Wax.....	1 pound.
Tallow (mutton or beef).....	$\frac{1}{2}$ pound.
Rosin	1 pound.
Turpentine.....	2 ounces.

Prepared as follows: Melt the rosin and tallow over a gentle fire, then add the wax, and when well dissolved set aside and add the turpentine; keep stirring until the turpentine has incorporated, and it is then ready for use, or may be set aside for future use.

Liquid grafting wax is made by melting one pound of rosin over a gentle fire and stirring in one ounce of beef tallow. Take from the fire, and when it has partially cooled mix in eight ounces of alcohol. If this cools it off too rapidly it must again be placed over the fire, but great care must be used to keep the alcohol from taking fire. When well incorporated and cool, put in tin cases or glass bottles. It should be kept well covered or corked. In using, a lump about the size of a hen's egg is worked with the hand, and a coating placed around the graft and smoothed over with the hand; the mixture hardens soon after.

WHIP GRAFTING.

This is one of the most simple of the divers methods of grafting young stocks, and is operated either in the field or indoors—on the bench. In grafting seedling stocks (one and two years) in the field, the stems of the stocks are cut off at the collar. The stems are cut by simply drawing the knife upwards, making a smooth, even, sloping cut, an inch or so long; then, reversing the knife, about a quarter of an inch from the center of this cut (towards the end) a slit or tongue is made downwards. The cion is then prepared (which should always contain three or four buds) in a like manner as the stocks. At the lower end of the cion a sloping cut is made downwards, and by reversing the knife a slit or tongue is made in it upwards, which should correspond with that in the stock, into which it is then inserted.

The bark of the cion and the bark of the stock must be placed in close contact on one side; the other is immaterial, as it soon heals over. The union of the two, cion and stock, should be complete and fit firmly. The grafts are then either waxed over or wrapped with waxed paper.

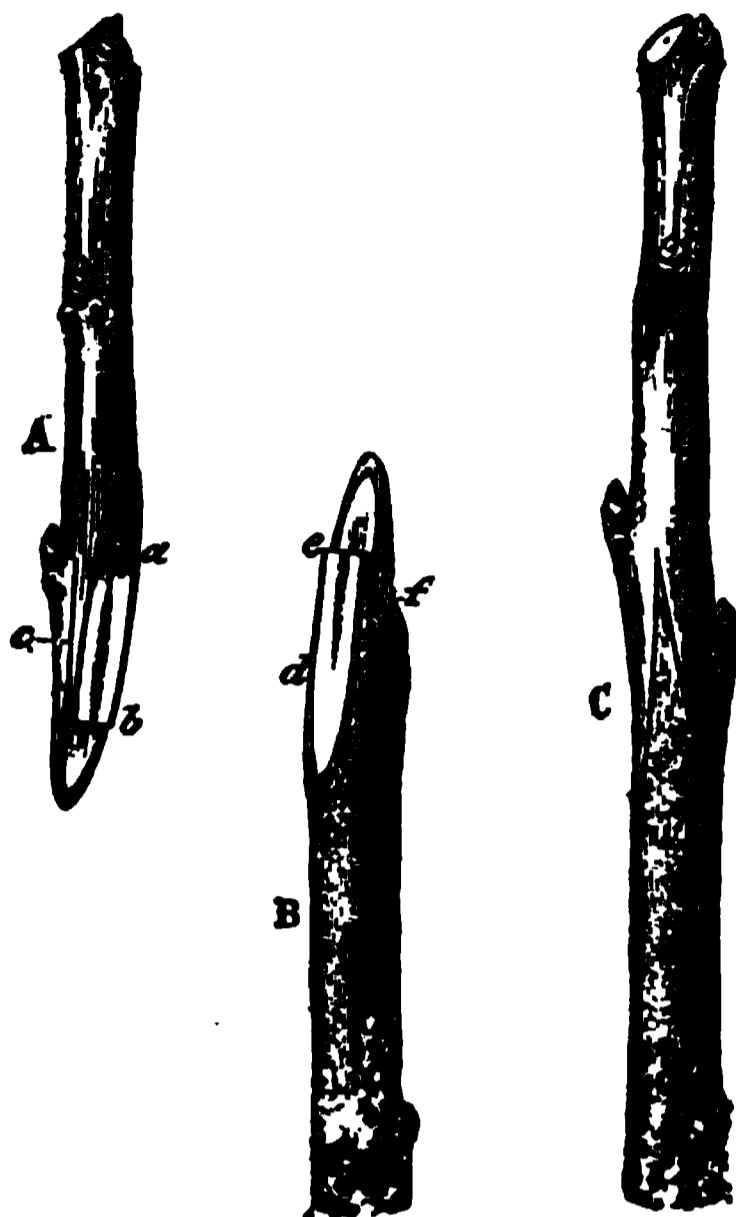


Fig. 7.

A. The cion. a. The sloping cut. b. The tongue. c. Shows thickness of tongue.
 B. The stock. d. The sloping cut in the stock. e. The tongue. f. Shows thickness of stock from the cut or tongue.
 C. The cion inserted, and ready for waxing.

This completes the operation. The earth may then be banked on either side with a hoe, and nothing more is done until they begin to start, when they require attention, especially in keeping them clear of weeds and all undesirable growth, suckers, etc.

ROOT GRAFTING.

For root grafting, the seedlings of one or two years' growth are taken up and the best roots cut into pieces about four inches long. These are taken indoors, washed free from all dirt, and grafted as follows: The operation is performed in the same manner as on the seedlings out of doors, as previously described. The oblique or sloping cut, or tongue, is made in the root; and the cion, which should be three or four inches long, is likewise prepared and inserted, as shown in Fig. 8.

It is then waxed over, either with wax or waxed paper; the latter, however, is much more preferred. The grafts are then put away in sand until planting time, in February, in the following manner: On the floor of a propagating house or shed sand is spread out from six inches to a foot deep, then the grafts are put into it standing, thickly, and covered with sand. The entire graft, to within an inch or two of the top, may be covered, without injury to it. They should, however, not be kept too wet, as the bark of the grafts is liable to decay; and again, they must not be allowed to get dry, as the bark of the graft will shrivel, and adhesion is avoided. During the time they are thus stored

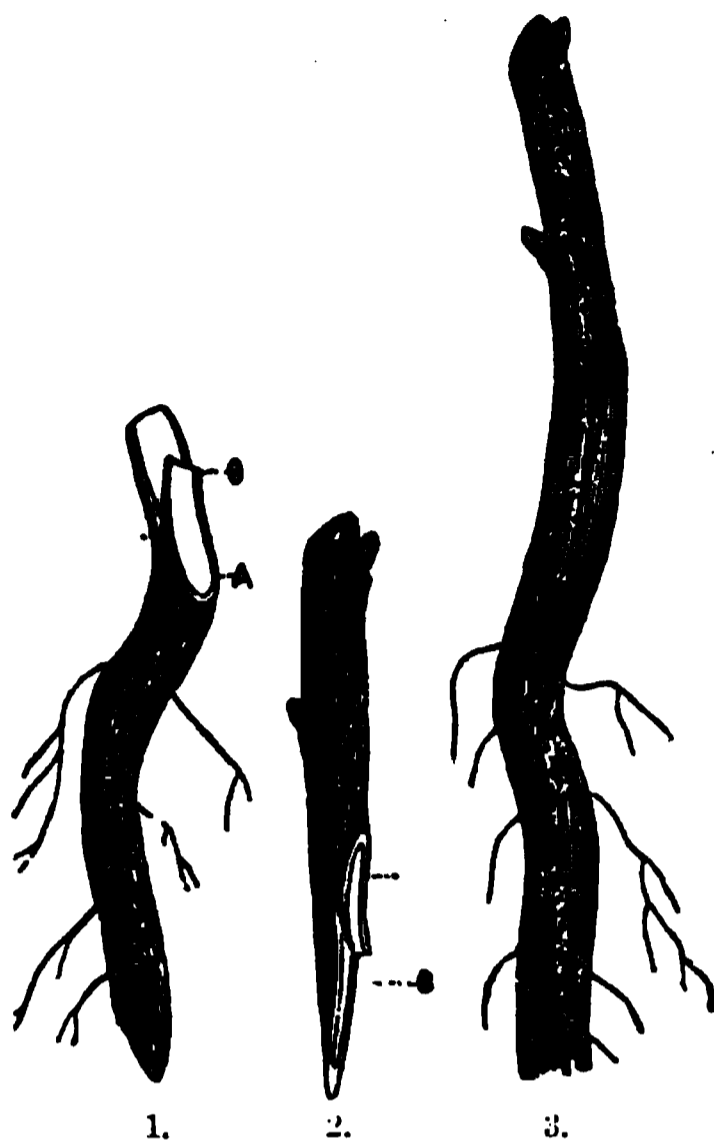


Fig. 8.

1. The root, showing sloping cut at *A*, and the tongue at *B*. 2. The cion, showing sloping cut at *A*, and the tongue at *B*. 3. The union of cion and stock ready for waxing.

away the parts united (cion and stock) callous over, and soon after planting begin to grow.

CLEFT GRAFTING.

This method is mostly practiced on stocks too large to be whip grafted, although it is also operated on young trees successfully. The stock is first prepared by being cut squarely off, as shown in Fig. 10 at *g*; a sloping cut is then made in the stock at *f*, and the top shaved smoothly at *g*, so that the point of union between the bark and the wood may be plainly seen. The blade of the knife is then driven into the stock, as shown in Fig. 9, to split it as represented. It is always best to prevent the stock from cracking or splitting clear through. This is avoided by using the knife properly. The point of the knife is driven in, as shown in Fig. 9 at *C*, and the blade driven in at *B*, and instead of forcing the knife down further to produce the split, it is drawn upwards and towards you, and a perfect cut without cracking through is made, as shown in Fig. 10 at *h*. The cion (Fig. 10, *A*) is cut precisely in the form of a wedge, with the part cut for insertion in the stock about an inch or an inch and a half long. It should always have a bud at the shoulder where it is to rest on the stock, and the outer edge thicker than the inner, and inserted so that the point of union between the bark and wood on both the stock and cion will exactly coincide, as shown in Fig. 10 at *C*.

On larger stocks the stem is sawed squarely off, and the surface dressed or shaved off with the knife. The knife is then driven into the stock, as shown in Fig. 11, and should be to one side of the pith. The split is kept open with the knife until the cion is inserted. It is always



Fig. 9.

Fig. 10.

Fig. 9. *A.* The knife as used in splitting. *B.* The point of the split. *C.* Length to split; the position (shown at *B* and *C*) shows how cracking of the stocks is avoided.

Fig. 10. *A.* The cion, showing how it is prepared—wedge-shaped—with a sloping cut. *B.* The stock prepared to receive the graft; *f.* The sloping cut; *g.* The horizontal cut; *A.* The split. *C.* The cion inserted in the stock, showing the close fit of both, and ready for waxing.



Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 11. The stock split, ready to receive the cions.

Fig. 12. *A, B.* The cions inserted, ready for waxing.

Fig. 13. *A.* The cion; *a, b.* The horizontal cut severing the chip on either side; *c.* The wedge; *d.* Pith; *e.* Point of cion cut obliquely.

Fig. 14. Graft inserted in stock obliquely.

best not to split too deeply, to allow the graft to work its way down a little and be held firmly, otherwise the graft will loosen and will not adhere. Then again, the operator must see that the stocks do not close so firmly on the cions as to crush the ends. To avoid this a small wedge is driven into the split on the opposite side. This, however, is seldom required where two grafts are inserted, as shown in Fig. 12. In most instances both cions grow, and as they are too close together, one is afterwards removed. There is more than one way to shape or face the cion, but the point in question should be the most expeditious one, and it has always proved that when the work is done rapidly the grafts take better, not because it requires carelessness (which should not be inferred), but because the sooner the graft is in position in the stock with less handling or whittling, the better. Where time is no object the following is a very good method of preparing cions:

The end of the cion is first cut (obliquely), then a cut is made at *a* and *b*, but deeper at *a*; then a shaving is taken off by drawing the knife from the end towards *a* and *b*. This cion differs from the one previously described only in the method of preparation. It is inserted in a like manner. The method of inserting the cion, and the splitting of the stocks, is not confined to those described, and growers generally find a way by which the method operated with can, in some way or other, be improved. For instance, where the splitting is done obliquely instead of parallel, the grafts take better. This is especially so in grafting prunes. The barks of the cion and stock come obliquely together, and the cion is held firmly in place.

GRAFTING UNDER THE BARK.

This is a very simple operation, and is performed just as the sap begins to rise in the stocks. Young peach, plum, and pear seedlings put forth quite early, and are grafted at any time after the leaves begin to grow, by the following method:

The stocks are sawed off, and with the knife a vertical incision is made on one side of the stock, the same as for a bud. The graft is then prepared, by simply facing on one side, as shown in Fig. 15 at *c*. It is then inserted in the slit, in the manner that buds are inserted, and is then tied and waxed over. For tying, waxed cloth is greatly preferred, as it serves both purposes—that of tying and waxing—in one operation.

GRAFTING THE FIG.

The fig can be grafted after the ordinary cleft graft, but budding by the method described under the head of budding is more easily performed and surer to take.

A. W. Cass, of San Diego, reports having been very successful in grafting the fig in the month of February, as follows:

“I saw off the stock; split it through the center. If the stock is two to four inches in diameter, I put in two grafts—one next to each side or bark. I cut the wedge-like taper about four inches long and have one or two buds only. The cions should be one half inch or less in diameter. When the grafts are both forced into the split there will be considerable space unoccupied. I fill the space with *hot* grafting wax—

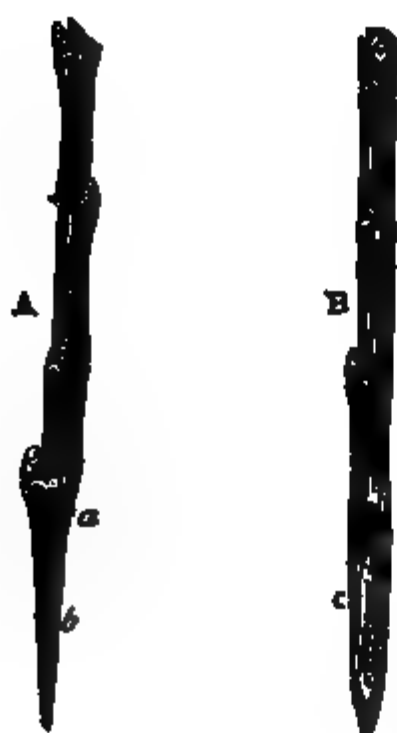


Fig. 15.

Fig. 15. *A.* The cion, side view, showing thickness of cut at points *a* and *b*. *B.* Cion, transverse view, showing how faced at *c*. *C.* The stock, showing how it is cut off and the incision made to receive the graft.

Fig. 16. OPERATION COMPLETE.—Stock grafted with two cions, and applicable to stocks with one cion. *A.* Twine, showing how it is tied. *B.* Waxed top surface. *C.* Waxed on the side, covering graft. *D.* Graft waxed at the end. *E.* Terminal bud, waxing at end not required.

that is, I heat my wax so hot as to *flow very readily*. I then with a paddle cover the end of limb around the grafts, also the ends of grafts, also the edges of graft and limb, after which I take a strip of muslin one inch wide and three or four feet long (must be strong), and wrap the limb and graft, commencing an inch or two below the lowest extremity of the split, wrapping and drawing the muslin very tight, at the same time waxing each turn of the cloth with the hot wax, using the paddle. When wrapped to the top of the stub, wrap the muslin between and around each cion, waxing carefully and thoroughly. The whole secret is to keep the air excluded from the cut. Fig bark shrinks very quickly—so quick, and so much, that the graft has not time to take before the bark is drawn away from it and the sap channels are dry. The *hot wax* is the only perfect way to protect it from the air, and the close and tight wrapping is to prevent shrinking of the bark. In other respects the rules of any other grafting hold good."

GRAFTING THE WALNUT.

The walnut is quite difficult to graft, on account of the large amount of pith the shoots contain. Young trees—a year old—are quite successfully grafted by the triangular crown method. The stocks are not split, but instead a triangular incision is made in the side of the stock, as shown in



Fig. 17.

Fig. 17 at *C*, about one to one and one half inches long. At this point the wood of the stock is generally quite solid, and the pith very small. This cut rather consists of taking out a triangular piece from the stock, into which space a cion is inserted of the same size. *D* shows the space; *A* the cion to insert. The cion is prepared to fit the corresponding space, from terminal shoots, as shown at *A*, and faced, as shown at *B*, and fitted into the cleft. It is then tied with cloth and waxed over. The soil is then banked up against it, covering the graft and stock to

within an inch or two of the top of the cion. In tying it is best to use cloth, and to only wax the parts cut or exposed, so that in a short time the parts not waxed may decay, and prevent the cloth from cutting into the stock. For making the cleft and facing the cion it is important that the knife be quite sharp. This operation is best performed, and most successfully, when the stocks begin to show signs of growth late in the spring. The cions are cut late in the fall, or early spring, and kept in sand preparatory to using.

GRAFTING THE OLIVE.

The olive is most successfully grafted during the months of March and April, but preference is given to those grafted in March, by the following deft method:



Fig. 18. Cion.

Fig. 19. Stock.

In this method the stocks are not split down the center as in the old way, but instead, the cut is made obliquely, so that the barks of the stock and cion may come obliquely together, and in which way the grafts make a surer and better union. The graft is faced on both sides, to be large at the surface side and thin at the inner, exactly in the shape of a wedge. The graft is driven down as far as it will go, and made to fit exactly, the barks of the cion and stock to be even on the surface side; the other side does not matter, as the cion unites with the stock at first only on the surface side, and in time both sides heal over. The graft having been inserted, it must be tied and waxed. For tying, cloth or twine may be used, and the wax applied over it. In grafting nursery trees in the field it is best to graft them low, the grafts to be covered with earth to within an inch or so from the top, leaving as little of the graft exposed as possible. This is a protection to both the cion and stock, especially from scorching heat, which causes grafts and stocks to die back when left exposed. The leaves of the grafts should never be broken off, but cut, nor must they be cut entirely off; at least one third of the leaf should be left (as shown in the figure) to prevent the graft from drying before it has had time to unite with the stock. Neither must the entire leaf be allowed to remain on the graft. The trimming of the leaf prevents it from carrying off too rapidly the fluids of evaporation.

PART V.

INSECTS INJURIOUS AND BENEFICIAL, WITH TREE
DISEASES AND THEIR REMEDIES.

CHAPTER I.

INSECT PESTS AND TREE DISEASES.

Almost every steamer that arrives at the port of San Francisco from foreign countries brings consignments of trees, plants, etc., and so far none have been found free from injurious insect pests. These consignments have been promptly placed in quarantine and disinfected, as provided for by the law and the regulations of the Board. There have also been large shipments of trees into this State from Florida, and in almost every shipment infected trees were found. It has often been asserted that the insects with which they are infected would not live in this State, but these theories have only proved fallacies. The same theory has been advanced with regard to other pests not yet on this coast, such as the plum curculio, etc.

Several years ago these same theories were advanced, when the late Matthew Cooke tried to make the people aware of the disastrous results that would follow if the codlin moth were allowed to spread. Our climate is mild, and therefore wonderfully favorable to the propagation and dissemination of all tree and fruit pests. Recently we have read with much amusement the many theories advanced with regard to the "yellows" and the "rosette" not thriving in this State. But in most every case the theorists are interested in the sale of cheap Eastern trees, and, of course, must give some theory or excuse through which they can dispose of their nursery stock. Recently several nurserymen have arrived trying to sell Eastern trees; one of these, in a letter addressed to me under date of November 4, 1891, said:

Fate seems to be against me. I arrived here (Fresno) last night. Have only seen one nurseryman here, and he says that the feeling here is so strong against buying Eastern peach trees—but he, like ——— and every other nurseryman I have met in California, says he thinks there is *no danger* of introducing the yellows into California by bringing in Eastern trees; that if it could be done you would have had it long ago from trees that have been brought in. In my opinion, it is ridiculously absurd; you had just as well say that you would allow no horses to come from the East for fear of introducing the heaves into California, which many of our horses have and yours do not. I am *so sure* there would be no danger that I would be willing to deposit with the State Board of Horticulture 25 per cent of all the money I get for my trees for five years, all of which I would forfeit in case the yellows developed from trees sold by me; but if it did not develop in that time, the money, with 7 per cent interest, to be paid to me. I wish you would write me fully, and at once, what you think of this proposition, and whether you could get the State Board together promptly and see if they would agree to this proposition. If I can't know very soon it will do me *no good*, as our packing season closes usually by the twenty-fifth of this month, and we can't pack four hundred thousand trees in a day or two.

It is well to be cautious, but this scare deters planters from planting trees, thus depriving them and the State of millions of dollars they might have. Dried fruit (peaches) will certainly advance. I think it is cornered now by speculators. I don't think there were over *twenty tons* of peaches dried in our peninsula this year.

This letter comes from a gentleman of very high standing, and my only regrets are that he should be in that business, and I have no doubt but that his intentions are well meant. The letter also contains valuable information. Delaware was once the most productive peach region of the continent. The yellows has laid almost everything bare, and,

according to his own statement, the entire dried product was less than twenty tons. He says he would be willing to deposit 25 per cent of all sales for five years for the privilege of selling his trees, and according to his letter he has four hundred thousand trees to dispose of this season. If that amount would be allowed to be brought into the State, in five years he would have disposed of two million trees. Certainly he could well afford to give 25 per cent of all his sales for the privilege of disposing of them. On the other hand, suppose the yellows developed, what recompense would his 25 per cent of all the sales be? Neither could the damage be roughly estimated. At the rate Eastern trees are selling, *i. e.*, \$75 per thousand, landed, two million trees would be worth \$150,000. Thus any business man can readily see that to sell \$150,000 worth of goods 25 per cent would be but a small margin when compared with the profits, and would simply be making the State the agent for the sale of Eastern trees. Any nurseryman would be but too glad of the opportunity of allowing 25 per cent off \$150,000 worth of sales, whether from the East or other localities.

The cottony cushion scale played great havoc with the citrus industry of this State in late years, by its introduction on a few trees, and the damage done to one section alone amounted to more than the total sales of citrus trees for twenty years. However, that trouble is over now, and the orange and lemon groves have been again restored to their former healthy condition by that wonderful little insect, the *Vedalia*, which might well be called a miracle. Should the "yellows" appear such results cannot be expected, from the fact that no one has yet discovered the cause, or effected a cure in a single instance.

We appeal to all who have an interest in fruit growing in California to guard against the introduction of this disease, or else the profit and glory of peach culture in our State will forever depart. Once the disease is among us, nothing can ever stop its destructive course, and the beautiful valleys now devoted to peach culture will be laid bare, like those sections in some of the States where the disease has appeared, the old stumps only remaining to tell where productive orchards once stood. It is to be hoped that those times may not come; but this is the time for active work, and we should not wait until the disease is among us before effective precautionary measures are adopted.

The following letter contains solid sense:

TULARE, November 8, 1891.

DEAR SIR: Considering myself on guard against "the yellows," I inclose a clipping from the Bakersfield "Californian" of yesterday. With all due respect to "a prominent horticulturist," I know of soil in Michigan, far above the average, where "the yellows" has flourished to its usual exterminating extent. I have long since learned "better to be safe than sorry," and why take a *single chance* toward introducing "the yellows" in this State? "God and humanity forbid," say I. My superficial mind can only imagine all evil and no good in it; as however careful the party may aim to be, how apt carelessness and neglect are liable to creep in; and then, of course, "very sorry," but that will not mend the error. Excuse the disgust and fear I herein express, for I feel it truly.

Hoping you can yet "nip in the bud" said "prominent horticulturist's" intent, I am,
Very truly yours,

[From Bakersfield "Californian" of November 7, 1891.]

In speaking of the yellows, that disease which has ruined the peach orchards of Maryland, Delaware, and very many other localities in the East, a prominent horticulturist here says he believes that disease cannot take root here.

He gives two reasons: the first, that it is a disease which so far has only appeared in impoverished soils; the second, that a humid atmosphere is a necessity. From both of these we are free.

At any rate, he is so convinced of the correctness of his reasonings that he intends to bud some trees here in California from trees known to be infected in the East. Of course he will take all proper precautions to have his experimental trees isolated and thoroughly quarantined against all orchards.

The idea is a good one, for it will determine what we may have to guard against by the most rigid restrictions, or it may, on the other hand, prove that we need fear no danger. It has not yet been absolutely settled that fruit pests are like contagious diseases, and can be carried to places foreign to them and there flourish as they do amid home surroundings.

It has not yet been shown that the disease will disappear from where it has been carried, nor has it been shown that it can be transferred to as rich and fertile a soil as ours is, and the finest climate known, and be relied upon to disappear. Until this theory could be proved, our quarantine against Eastern trees is the only safeguard.

The following is from the San José "Daily Herald" of December 19, 1891:

Everybody concerned in the prosperity of Santa Clara Valley should do his utmost to prevent the importation of Eastern trees. All the pests that have ever been found in our orchards have been imported into the State through the cupidity of persons having trees to sell, or the ignorance of those who have planted orchards. It has cost a vast amount of money and immense trouble to rid ourselves of these pests, and now it is purposed to import the curculio, the peach-borer, the yellows, and a hundred other pests that have ruined many orchards in the Eastern States, simply to make money for Eastern nurserymen and their agents. This is a crying shame, and the men who have fought for so many years to bring the growing of fruit in this valley to its present high state of prosperity, would be fully justified in taking every imported fruit tree and burning it. But there is no necessity to proceed to violence. The laws of the State, if strictly enforced, are sufficient to protect the public interests from rascality of this sort. All the responsibility of enforcing the law should not be laid upon the State Quarantine Officer. He should be backed by all the influence and authority of the various organizations of fruit growers, as well as by every individual interested in the business. If we permit these trees to be planted in the valley, we deserve to lose all the advantages we have gained by our vigilance and intelligence so far.

Let it be distinctly understood that if the pests now prevalent in the Eastern States once obtain a foothold in California, it means the absolute ruin of the fruit industry. Many of them are kept in check by the severe winters of the East, but in this climate of perpetual spring they would multiply and thrive until they would soon defy all efforts to dislodge them. Let the curculio, for instance, once get into our orchards, and it will be the last of our magnificent prunes and apricots. Those of us who are familiar with the ravages of this pest, know that it often does not leave a single sound prune or peach in the orchards for miles together.

Too much vigilance cannot therefore be exercised in this matter, and the "Herald" urges every fruit grower to use his utmost efforts, not only to prevent the planting of trees from Eastern States, but to aid the State Quarantine Officer in destroying them. We cannot afford to take any chances in this matter; all our future prosperity depends upon prompt and vigorous action.

The following is from the "California Fruit Grower" of November 14, 1891:

A local paper states that a prominent horticulturist of Kern County intends to import a number of yellows-infected peach cions from the East and insert a lot of the buds in the peach trees of his orchard. This he is going to do, so it is stated, in the interest of science, to determine whether the peach yellows will thrive in the peculiar climate of California. He proposes to "quarantine the trees," and presumably the air, birds, and insects of the region as well. We have heard of lots of fool-hardy experiments in our time, but this caps the climax. It would be a good idea to box up this horticulturist and send him to the World's Fair. California is too slow for such a genius, and his inquiring mind should have a broader latitude. The fruit growers of California are willing to let science wrestle with the peach yellows on the other side of the Rockies, and the man who imports the disease into this State under any pretext whatever will make for himself no end of trouble and will find his name in very bad odor. Original investigation is to be encouraged; but when it comes to "bringing smallpox into one's family to see whether the children will sicken and die from it or not," it is time to call a halt.

I have taken measures to ascertain who this party is that intends to propagate the disease for experiment, and will try and prohibit him from carrying out such foolish ideas, and through which means the disease might be introduced, greatly to the injury of the fruit industry.

The publication of resolutions of warning by the Board, and a pamphlet in which the disease was described, together with a map showing the districts affected in the East, and its rapid increase, have had a very beneficial effect in preventing many carloads of cheap Eastern trees from being landed in this State. The various counties have appointed County Boards of Horticultural Commissioners, and it can safely be said that the interests of the county each represents are not overlooked, and all are doing good and effective work. The following letter from a large dealer in Eastern trees is added, to show that the warnings thrown out have not been altogether "moonshine:"

SAN JOSÉ, November 5, 1891.

SIR: I have finally decided, by advice of my friends in the East, not to risk the annoyance of shipping in any Eastern peach trees.

The following is from the Riverside "Press" of November 14, 1891:

We have just received a letter from a prominent Missouri nurseryman, complaining bitterly of the action of Secretary Lelong and the California State Board of Horticulture for their action in condemning the peach trees grown east of the Rocky Mountains, because of the danger apprehended from the "yellows" among them. He charges the Secretary with having been subsidized by local nurserymen, and asserts that much Eastern stock is being carried into California by way of the Washington and Oregon nurseries, in spite of the prohibition. He claims that the nurseries in Missouri are entirely free from the trouble feared, and thinks he should be allowed to ship trees raised from the seed of trees grown in that State, where no infection exists. He has spent thousands of dollars to prepare himself to supply the California trade, and feels that the quarantine works an unjustifiable hardship upon him, and compels the Californians to pay an excessive price for their trees. We admit that the radical course of our officials seems hard on the outside nurserymen, but if it postpones for years the advent of the "yellows" into this State, it will prove a fortunate thing for the orchardists and the State at large. There are enough nursery trees of all kinds in this State to plant as many acres as the growth of the market will justify, and if the action taken does limit tree-planting a little, it will not be an unmixed evil.

It is not surprising in the least that they should complain bitterly at not being allowed to dump their infected trees in our State. For several years this State has been used as a dumping ground for all Eastern and foreign trees, and on this account many new pests have made their appearance here. Why should the practice be allowed to be continued longer? There is no reason why the people should not grow their own stock, and avoid the risk of sooner or later having to abandon their orchards, which they must do if the disease ever gets a foothold here, as nothing can cure or stop its ravages.

The following Associated Press dispatch tells us of a measure now before Congress:

WASHINGTON, January 4, 1892.

Congressman Caminetti has prepared a bill of great importance to the horticulturists of California, and he will introduce it to-morrow if possible, with the intention of having it reported next week, thus giving it a place on the calendar. It will prohibit the interstate transportation of trees, plants, vines, and nursery stock infested with scale insects, codlin moth, or other pests, with their eggs or larvæ.

The bill provides heavy penalties for violations of the law, and covers every loophole of escape so well that violations will be extremely hazardous. Owners or agents who ship infected trees or plants are liable to a fine of \$1,000, or imprisonment for one year, or both. Railroad, ship, steamship, express, or other transportation companies, if caught in the act of shipping such trees or plants from one State or Territory into another, are also liable to pay a penalty of \$1,000. It is not necessary to convict them of a specific charge of carrying from one State to another, but if dangerous trees are found in their possession, consigned to another State or Territory, sufficient proof will have been acquired to convict. The penalty will be recovered by a civil action brought in the United States Circuit Court. Foreign railroad or steamship companies are equally liable.

To add to the stringency of the law, conductors, masters, captains, or agents in whose

care infected plants are found, can also be fined \$250 each, or imprisonment for three months, or both. The Department of Agriculture is empowered to prepare rules by which transportation companies, and their officers and agents, as well as United States officers, can guard against the violation of the Act. The department may also appoint agents, whose duty it shall be to enforce the law. Where States, as in the case of California, have Boards or Commissions empowered to guard against the introduction of dangerous pests, the Department of Agriculture may appoint such Board or Commission, provided no expense is incurred by the United States in so doing.

This bill carries no appropriation and may pass.

The following is from the "Pacific Rural Press" of January 16, 1892:

There is no more important item in our local agricultural affairs just at present than the issue which is being forced on the practical exclusion of Eastern-grown peach, plum, and apricot trees, because of the ravages east of the Rocky Mountains of the dread disease known as the "yellows." This issue, interfering as it does with courses of trade which have long prevailed, naturally excites opposition among Eastern tree growers, and upsets the calculations of local tree dealers who have hitherto relied, in whole or in part, upon the importation of Eastern-grown trees.

Probably no measure can be adopted without interference and hardship to some people. We sympathize with Eastern tree growers who have laid out their future upon sale of stock in California. Some of them have been very enterprising in propagating the varieties our planters desire, and have undertaken, at large expense, to procure buds from California orchards. We do not wonder that they feel aggrieved, and that they protest against the position now taken by California fruit growers at their public meetings and through the State and County Boards of Horticultural Commissioners. We have received a number of communications on this subject from Eastern parties, which enlarge upon the grievousness of the situation in which they are placed, and we sincerely regret that they have to suffer in the ways described.

And yet what can California do otherwise than she has done? Here we are with a vast and growing peach interest. It is by much the greatest deciduous fruit interest of the State at present. More than this, we are free from this terrible disease which destroys peach orchards almost with the rapidity of fire or tornado. One cannot read the most conservative reports on this subject, such as appears in the Government publications, without being appalled at the insidiousness, the swiftness, and the effectiveness of the scourge. There is no pest or pestilence among fruit trees which can compare with the but little understood malady known as "peach yellows."

In view of these things, what can we do but protect ourselves? To weaken or to provide for future restriction may be to "lock the door after the horse is stolen;" the animal is now in the stall, vigorous and healthy, and promising—let the doors be locked at once.

It has been charged that this movement is at the instigation of the California nurserymen, and is for the purpose of corraling locally the trade in trees. This is not true on the whole, and, in fact, we believe they have had very little or nothing to do with it. Perhaps an indication of this may be found in the fact that many California nurserymen expected to handle considerable quantities of Eastern-grown peach and prune trees this year, and had orders placed for them which they, in some cases at least, countermanded as soon as they knew of the stand taken at the Marysville Fruit Growers' Convention. The result will undoubtedly favor the local growth of nursery trees, but, unless we are very much mistaken, our California nurserymen had very little to do with the incisive action which has amounted almost to a practical exclusion of Eastern trees.

Again, the present California stand on this subject is not a local scare. It comes about through Eastern publications as to the character of the yellows and the intensity of its ravages. Current Eastern reports, backed up by Government investigators, must be charged with this protective action by the California fruit producers. Just as we write the mail brings us a new Government publication on this question in its most startling phases. It is entitled "Additional Evidence on the Communicability of Peach Yellows and Peach Rosette," and is by Dr. E. F. Smith, the Specialist of the United States Department of Agriculture, who has been engaged upon this particular investigation for several years. Let the Californian read the following quotation, and see that his protective action is not too early nor too incisive; and let the aggrieved Eastern nurserymen also read it and perceive that it is not an issue forced by local nurserymen, upon selfish ground. We quote from Dr. Smith as follows:

"It is proper to state, however, that the losses continue in the infected districts; that the disease has appeared in new localities, and that regions now healthy are also threatened. The yellows is certainly as far south as southern Virginia, and probably as far west as Arkansas and northeastern Texas. Peach growers are earnestly advised to stamp out the disease upon its first appearance, and are warned against the importation of trees from infected districts. These remarks apply with especial force to the Pacific Coast; and in this connection it is well to remember that the apricot and almond are also subject to the yellows. It would be much safer for the Californians to grow their own peach trees than to introduce any from the eastern United States. If trees are imported it should be known beyond question that they are from regions where this disease does

not occur. The mere fact that the nursery stock is healthy at the date of shipment is not a sufficient guaranty that it will continue so."

This is warrant for all California fruit growers are doing, and it should be sufficient to disarm criticism. This State cannot afford to proceed longer in defiance of this disease, but is justified in the most stringent measures for its exclusion.

It is, perhaps, natural that the first thought of those who are temporarily troubled by the refusal of Californians to receive their trees should be retaliation. We are not surprised, then, to find one Eastern tree grower writing us in this way:

"Our only recourse will have to be to get similar laws passed by this and adjoining States to exclude California fruit, on account of its sanitary condition. We think, if we try, we can get laws that will operate as much against the fruit growers of California as they can be, excluding our stock."

This is a heathenish threat, and none, perhaps, will be more ashamed of it in a little time than those who propose it. It is not to be feared on our part, for it is idle and impracticable. No Legislature could be made to adopt any such enactment, nor could facts be shown which would justify it in the minds of any fair-minded men. Our Eastern friends in the nursery line, before any such venture could be undertaken by them, would remember that such action would be against their own customers and friends, and in many cases against their own investments. We look upon the threat as merely a manifestation of chagrin, resulting from misapprehension of the motives which prevail in excluding trees from doubtful or infested localities. Usually the ill temper which arises upon misapprehension quickly passes away.

That the Eastern tree dealers are greatly exercised over the attitude of California in regard to the importation of diseased trees, is shown by the letter printed below, which appears in the San José "Mercury" of January 19, 1892, which was received by a nurseryman of San José. It will be seen that there is a desire to retaliate by urging Congress to remove the protective tariff from foreign fruits in order to injure the California industry. There is hardly a doubt, however, but that such an effort would fail, for no matter how great the pressure brought to bear, Congress would not be apt to lend itself to such a heathenish movement, the sole object of which is to ruin the great industries of California.

The letter reads as follows:

NEWARK, WAYNE COUNTY, N. Y., January 11, 1892.

DEAR SIR: I do not think that it will be for the good of the fruit growers of California to have your Commissioners burn any more Eastern trees. I have letters from three of the largest nurserymen in the East asking me to attend the January meeting of the New York State Nurserymen, and make a statement of what I know about the way that the Eastern nurserymen have been treated by California Commissioners; and also asking me to go to the National Convention which meets in June, and make the same statement there. The object of this request is to have all the nurserymen in the East join in a combination to get Congress to take off the duty on raisins, on apricots, and on prunes, that are imported from the Mediterranean, and the reason why they want this done is because that they believe, and I would not wonder if it were true, that all the laws that have been passed lately ruling the Eastern trees out of California, have been enacted at the request and instigation of California nurserymen for their own selfish purposes. There is no doubt that the wholesale grocery trade, which amounts to a good many thousand men, will join the nurserymen in this movement, and if they succeed in doing what they propose to do, it would be a death blow to the fruit interests of the State of California, as it would let in all the Valencia raisins, all the French apricots and prunes, all the German prunes, and Turkish prunes, without any duty whatever. I have refused so far to grant their request, but it is a question with me whether I should not do as they have asked me, and give the full knowledge that I have of what has been done in California to rule out the Eastern trees without good cause. I think it would be well for you to consult some of your leading men, if you know them, in California, and see whether this thing had better go on until it has killed all the green and dried fruit interests of California, as it surely will in the line of raisins, apricots, and prunes. A duty of 2½ cents per pound on prunes, apricots, and raisins is a great protection to the planters of California, and if this was once repealed it would be a hard matter to get it back again. You can, no doubt, see what the power of the Eastern nurserymen would be, joined together with the wholesale grocers, to move Congress, especially if they show up the facts of the case, that the nurserymen of California have instigated a law, under cover of protecting the planters from insects, to destroy all the Eastern trees that come there. You will possibly remember that Minnesota enacted some such a law to protect her farmers in the line of some item, which, I think, was the importation of dressed beef. This did not last long, as the flour that was manufactured in Minneapolis and St. Paul was ruled out of different markets, so that they had to repeal the law against the importation of beef. I would like to have you consult with some of your leading men

and give me the best information that you can as to what effect this would have upon the planters of fruit gardens in California, and do it at your earliest convenience, as there will be a meeting of nurserymen the last of this month in the State, and probably a semi-annual meeting called of the National Convention of Nurserymen at an early date.

Yours truly,

Commenting upon the above letter, the San José "Mercury" of January 20, 1892, says:

One of the most extraordinary exhibitions of the folly into which spiteful feelings will betray men was made in the letter of Jackson & Perkins, of Newark, New York, which was published in the "Mercury" yesterday. These gentlemen begin by asserting that "it will not be for the good of the fruit growers of California to have your Commissioners burn any more Eastern trees." This assertion is followed by a statement that the New York nurserymen propose to get the National Nurserymen's Convention and the wholesale grocers of the East to combine, for the purpose of inducing Congress to take the duty off prunes, raisins, and apricots, by way of retaliation on the fruit growers of California for refusing to receive into this State fruit trees from the East; and the plain warning is given that unless we consent to receive Eastern trees, this form of retaliation will be carried out and fruit growers deprived of the benefits of protection. It is difficult to conceive how such a policy could have been devised by men who have brains enough to carry on any business whatever. The writer asserts that the action of our Commissioners, in burning Eastern trees sent to this State, is due to a desire to prevent their competition with California nurserymen. The assertion hardly merits the trouble of contradiction. No trees have been burned in this State, nor sent back to their owners, unless they have been found to be infected with some form of pest or disease; and when they have been found to be so infected, it is not so much the California nurseryman who advocates their burning as the California orchardist. The investigations of the Government have found that the dangerous disease "the yellows" has now spread all over the East from Delaware to Kansas, and from Michigan to Georgia, and experiments have shown that it is readily communicable from one tree to another. Under these circumstances our orchardists would be foolishly reckless if they did not strive, by every means in their power, and in that of the State, to keep the disease away from every part of California.

As for the threat of retaliating, by getting Congress to repeal the protective duty on our dried fruits, we can only say that this seems to us a little bit the most brainless bluff we have heard in a long time. We have no intention of denying that the National Association of Nurserymen is a most reverend, grave, and potent body, and we admit that where its dignity is augmented by an alliance with the wholesale grocermen of New York, it becomes august and worthy of doing obeisance to; nevertheless, it is not bigger than the United States by several immense degrees. Congress knows very well that the question of protection to American industries was submitted to the people four years ago, and the distinct, emphatic answer given to it is still visible to men in the Senate and the White House, and plainly readable to all in the McKinley tariff. It is not likely that any statesman, or even a politician, will be induced to believe that the decision of the people thus given can be overruled by the threatening nurserymen. Congress will not undertake to repeal the duties on dried fruits. They are a part and parcel of that great system of protection which is the animating spirit of our industries, and to which the great body of Americans are heartily devoted. The threat of retaliation, therefore, is as silly as the assertion that Eastern trees are burned in the interest of our nurserymen is unfounded, and taking the whole thing into consideration, we are quite sure that it will be for the good of the fruit growers of California to burn as many more Eastern trees as our Commissioners decide ought to be burned.

The San Francisco "Examiner" of January 20, 1892, commenting upon the same letter, says:

The threats of the Eastern nurserymen to be revenged on California for the action of the Horticultural Commissioners in seizing infected Eastern nursery stock can be borne with equanimity. The hint sent out to the California fruit men that the Eastern nurserymen will join hands with the wholesale grocers to have Congress take off the duties on raisins, apricots, and prunes will cause no anxiety. California is not to be frightened by such a possibility. If Congress will take off the duties on the articles they use, California growers will consent to have the tariff taken off the things they sell. But Congress is not likely to listen to any band of nurserymen who appeal to it for the noble purpose of being revenged for not being allowed to sell diseased plants in California.

So far from relaxing any of the protective regulations enforced, California is determined to strengthen them. The orchardists of the State have had some experience with imported pests and diseases, and will keep from having any more, if that is possible. They have paid some millions of dollars for their experience, and intend to avoid further loss from the same cause. There are many fruit pests and tree diseases in the East that have never entered this State. The exemption of California from their ravages has been

a matter of good luck rather than of foresight and precaution, for little attention has been attracted to the subject of quarantine or disinfection of imported stock, and none at all to its exclusion till after the disastrous experience with the cottony cushion scale. The early orchardists had an idea that the climate of California was fatal to pests. This belief resulted in bringing a large number into the State, and it is now evident that a fruit pest will thrive where the fruit it lives on will flourish. This is what makes it necessary to be strict with Eastern nursery stock. There are some orchardists who are willing to risk the destruction of their trees and the loss of thousands or millions of dollars to the State for the sake of saving a little money in the first cost of the orchard. But the main body of the orchardists know their interests too well to consent to any relaxation of the precautions that have been taken. If the Eastern nurserymen do not want to send their trees here under such conditions, California will manage to get along well without them.

There have been various assumptions that the action of the State Board of Horticulture is one of persecution, leveled against Eastern nurserymen in the interest of California tree growers. An imputation of this character is too small to require serious consideration. Suffice it to say, that no member of the Board, nor any of its officers, has ever lent himself to so small a business as boycotting any one. The statutes of California, providing for the preventing of the introduction or spread of insects or diseases injurious to our fruits, are general, and are not in any manner aimed at the Eastern nurseryman, nor do they reach in any way stock that is not infected with diseases or pests that may endanger our orchards. Eastern trees, or trees from any foreign country, may be imported into California in any numbers, provided they are not infected.

The laws which have been enacted to protect the horticultural interests of the State are general, and people, whether residents of California or not, are presumed, and conclusively presumed, to have notice of its provisions, and no one in any prosecution under these Acts can plead ignorance of their provisions.

It is incumbent upon every orchardist to disinfect all fruit trees grown on lands infected with any insects, or by any contagious disease known to be injurious to fruit, etc. This not only applies to home-grown trees, but to any that may be brought from any districts, whether in the United States or in foreign countries.

If the Eastern nurserymen had trees perfectly free from pests and diseases there would be no trouble. The fact of the deadly yellows and rosette abounding in many of the Eastern States, and destroying the peach orchards everywhere, has caused every load of Eastern trees to be rigidly inspected. If the slightest trace of infection is found the trees are condemned, and proceedings at once instigated to have them destroyed. If one tree infected with the yellows gets in here and afterwards the disease develops, the duty on foreign fruit can be taken off, for there will be no need of protection; for if the disease spreads with the rapidity it does in the Eastern States, California will have no fruit to protect, and the disease will never be gotten rid of, as there is no cure for it.

There is more danger of ruining the California fruit industry by importing diseased trees than by removing the tariff. We might recover from the effects of tampering with the tariff, but if the yellows ever gets here it will come to stay, and California will never recover from its effects.

Lastly, the districts in the Eastern States where the yellows has appeared were once flourishing orchards, and now are nothing but leafless, bare-limbed trees and trunks. California is so situated that careful espionage should be exercised over every importation, and it is the

bounden duty of every citizen interested in the future welfare of the State to keep out all known tree diseases and fruit pests. The fruit interests of California bid fair to become the greatest of all in the world, and from it many families will derive comfortable support in years to come, and some will amass exceeding great wealth. Therefore, these interests deserve, aye, they demand *protection*.

HOP APHIS.

The English hop aphis (*Phorodon humili*), which has proved such a menace to the hop industry of England and many sections of the East, has made its appearance in several parts of Oregon. In August (1890) several packages of infested hop leaves were received from Lane County, Oregon, which, upon examination, proved to be the *Phorodon humili*, or English hop aphis. I at once addressed letters to the Entomologist of Oregon, Prof. F. L. Washburn, and asked him, in view of the threatened danger from this pest, to take every means possible to stop its spread into this State. Professor Washburn later visited the districts along the Mackenzie River, from where the specimens were sent, and found those districts badly infested, but the injury was not altogether confined to that locality or to Lane County. Marion, Polk, Benton, and other counties suffered to a greater or less extent. The results of Professor Washburn's observations were immediately published, and hop raisers were urged to destroy, by burning, all unremunerative plum thickets, upon which the *Phorodon* lay its eggs, and from which they spread onto the hopvines soon after hatching. As the *Phorodon* has made its appearance so near to us, the hop growers are urged to examine their vines, and if the aphis is found upon them to at once communicate with the Entomologist of this Board, that it may be promptly investigated. The importing of hop plants from Oregon should also be avoided, as in this way the hop aphis is taken into new fields.

From the following, taken from the "Oregonian" of June 5, 1891, it appears that the hop aphis is also in Washington:

At the recent meeting of the Hop Growers' Association of Washington, C. P. Hayes, one of the most extensive hop growers in the State, in course of an address said, in reference to the hop industry of Washington, that "there was no concealing the fact that the situation of the hop interest is exceedingly critical at this moment. There is no mistaking the fact that the hop louse, the greatest enemy the hop grower has even known, is here to-day in most of the yards, and it will gain a foothold in all. Something must be done or the crops will receive untold injury. I have prepared myself to fight the insect, and I want every man to do the same."

INFECTED TREES FROM TAHITI.

A shipment of three hundred and twenty-five thousand orange trees arrived last June from Tahiti, with no less than nine different kinds of insects upon them; of these, two are entirely unknown to this coast, and are very injurious; one of these in particular proved hard to exterminate. The one referred to lives under the bark, and therefore cannot be killed with remedies. This cargo was placed in quarantine immediately upon arrival. The danger of these pests spreading being so great, proceedings were instituted before the Superior Court at Los Angeles. The Court, instead of ordering the trees destroyed, ruled that they must lay in quarantine until the importers prove that all insects upon them are dead. Since that time most of the trees have perished, and those

that are still alive have been repeatedly treated by the owners, with only partial success in destroying the insects. The Attorney-General will soon again institute proceedings, and it is to be hoped that the Court will order them destroyed.

This and many other cargoes that have arrived have required personal attention of the Quarantine Officer, and a deputy was appointed temporarily to inspect all ships that arrive from foreign countries. At present we know of large consignments of trees that will begin to arrive soon from the East, and every precaution will be taken that no new pests be introduced. This division has from time to time issued such instructions and advice as occasion required.

GRASSHOPPERS AND CRICKETS.

The grasshopper plague this year appeared in many districts in the State. It is not expected that they will appear the coming year, unless there may be species that did not hatch this year.

Ed. M. Ehrhorn, who was delegated to make an inspection of the northern part of the State, reported as follows, viz.:

Having received orders from you to proceed to Yreka on July 1st, I left San Francisco on the evening of the same day.

At Cottonwood I began my observations. The country here has a few scattered orchards on red soil. I noticed a few grasshoppers, and some young trees were protected with bags. At Anderson the trees and vines looked well. At Redding the soil is a gravelly loam, and the orchards and vineyards are in fine condition. From Redding to Sisson I found good land, and orchards looking well. At Montague I noticed the first crickets. From here I moved to Yreka. I expected to find this place in trouble, but did not find any crickets. Inquiring about these insects, Hon. G. A. Robertson kindly gave me letters to Clarence Prather, whose ranch is about three miles north of Montague. On July 3d I visited his ranch. The crickets here were very abundant. They seemed to feed mostly on natural grasses and weeds, but would also attack cereals, especially barley. Mr. Prather informed me that these insects appear every year, but they were extra numerous this season. They are good food for hogs and turkeys, although the latter soon get tired of them. Bands of hogs are turned into grain fields, and relish the insects, which seem to fatten them. Although these insects are called crickets, they are not real crickets, but shield-backed grasshoppers, of the genus *Anabrus*, family *Locustidae*. The specimens I found resemble *Anabrus simplex*. A peculiarity of these insects is, that when one gets injured the others eat the body of the injured. About 10 o'clock A. M. they climb the fences to sun themselves, and the fence boards are so thickly covered that they look black. About 1 o'clock P. M. they crawl down and feed till 5 P. M., and then crawl up on the fences and rocks. The male stridulates with two small wings hidden under the pronotum. The pronotum is of enormous size, covering the two other thoracic segments, and is well rounded behind.

The female has a long ovipositor, and was already depositing her eggs. I arrived here too late in the season to observe many of their actions. A few females had a white glutinous matter attached to the vulva, some more and some less. When I dissected the ones with a great quantity of matter, I found the eggs not thoroughly developed; and in those with less matter, the development was greater. I found places where eggs had been deposited, and counted from twenty to thirty eggs in each sac. This sac is from one quarter to one half of an inch long, and of a light brown color. All the insects were infested with *Astoma gryllaria* (Le Baron), some very much so.

I dissected over two dozen grasshoppers, and did not find a single sign of an internal parasite. The males and females seemed to be very evenly divided.

Poisoning does not seem to affect these insects. I tried three parts of Paris green to ten parts of flour, and three parts of arsenic to ten parts of flour, both dry and wet; they ate it, but did not die nor seem to suffer. Strychnine was also tried in the same mixture with bran, but of no use, because enormous quantities were required to lessen their numbers. I placed one of these insects in cyanide for one hour, and when removed it was still moving, but afterwards died. After cutting the head off of one the muscular movements were observable for an hour. The only way to reduce the number of these insects is to find their laying grounds and turn the soil over. The winter of 1890-91 was a very mild one, and farmers say that the soil generally freezes very hard, but did not do so last winter. No doubt climatic influences have a great deal to do with the number of insects.

On July 4th I stationed myself at the place of Mr. Fred. C. Miles, near Penryn. On my way from Sacramento I observed very few hoppers. At Rocklin I noticed some trees covered with bags, where the hoppers had given trouble. At Loomis and Penryn, as well as at Newcastle, the hoppers were very numerous, eating everything they could

reach. When they had no wings, a wash of one fourth pound of whale-oil soap to one gallon of water was found useful in keeping them in check. Poisons have been tried, such as Paris green and arsenic, in proportions of three parts of poison to ten parts of bran or flour, but the insects are very restless, and it does not kill enough to pay for the trouble. Phosphorus and strychnine in the above mixture were tried, and killed them.

The best protection to young trees is to cover them with cotton bags. These grasshoppers not only destroy the leaves but also the fruit. They eat the skin off peaches and apricots, which soon turn sour.

Smoking was tried, but did not affect them. The only way to prevent the pests next year is to watch where the females deposit their eggs, and then either plow or dig up such places.

Gustav Eisen, who was detailed to make an examination of the grasshopper plague in the upper Sacramento Valley, reported under date of June 10, 1891, as follows:

Grasshoppers are breeding in large quantities in portions of Tehama County. Their breeding places are generally low, open places, sometimes many miles apart. In these breeding places they are now seen in very large quantities, hopping towards the north-east principally, and slowly moving in that direction. Between these breeding centers hoppers are also seen, but in very much smaller quantities. Few hoppers have as yet attained the winged stage, and by far the vast majority are now only half grown. The latter do the principal damage. So far no very great damage has been done in this county, and only the outskirts of some orchards and vineyards have been attacked, and small, outside trees defoliated without suffering any permanent injury. I visited the vicinity of Red Bluff, seven miles north and east and twenty miles west and south, and found the quantity of grasshoppers to be much less than in 1885. They are of at least five different species, those yellowish and striped being the most common. I found no crickets anywhere here.

The orchardists are using several remedies. One consists of driving the grasshoppers by means of sacks, either tied to sticks or tied together in streamers. The hoppers are driven to dry, grassy plots, which are afterwards fired. Some farmers scrape up the grasshoppers by the aid of buckets. The hoppers ascend the tops of the alfalfa early in the morning, or rather roost there, and are caught in the same way as insects are caught with a net. They are thence transferred to sacks. In this way one man caught thirty pounds of hoppers in one hour's time, and three men caught five hundred pounds in three hours. The damage to this alfalfa field was considerable.

A very successful contrivance I saw used consisted of a long trough made of sheet-iron, five feet long, two feet wide, back two feet high, front three and one half inches. This is first filled with coal tar, or with a mixture of coal oil and water, and is then dragged between the rows by two boys, by means of two ropes twelve feet long. The hoppers fly up and, striking the high back, fall into the coal tar mixture.

In Capay Valley, in Yolo County, I found few grasshoppers; indeed, they were here rather scarce; but on the plains, at the entrance to this valley, the hoppers were very numerous, and some little damage was done. Some vineyardists used here the arsenic and bran remedy. Around Sisson and further north the principal damage to crops is done by a cricket of the genus *Gryllus*, not by regular grasshoppers.

OTHER PESTS.

This State is as yet free from the plum curculio, and it is to be hoped that it will always remain so; yet we should not relax our efforts to keep it out. The fact that this insect has caused plum and apricot growing in many parts of the East to be abandoned, and that they are only grown where heroic efforts have been resorted to, should be enough warning for every one to do his utmost in preventing its introduction here.

In some sections a new caterpillar made its presence felt this and last year for the first time, attacking the walnut. It is a very serious pest, and as yet new to science, and we are in a quandary to know from whence it came. The larvæ attacked the trees in such immense quantities that the destruction of the foliage was only a matter of a few hours. As soon as observed, however, measures were taken to destroy them, which was done very effectually before they had done much damage.

In some of the prune districts several species of caterpillars also appeared, and so suddenly and unexpectedly that the growers were taken

unawares, and for a time it seemed as though they would devastate everything before them; but the fruit growers were not to be worsted, and promptly adopted measures through which the insects were put beyond the stage of destruction.

The season of 1891 opened with a most encouraging future before it, and it was predicted that it would be the most prosperous season for all fruits ever known in the State. Fruits of all kinds, flowers, etc., bloomed freely, vegetation of all sorts put forth as it had never before, and there was general rejoicing at the outlook of the season; but in the midst of this rejoicing came myriads of malignant insects, that stole from the growers a goodly share of their profits.

CHAPTER II.

SCALE INSECTS, AND REMEDIES FOR THEIR DESTRUCTION.

MYTILASPIS POMORUM.

[Figs. 1 and 2, Plate IV.]

Infesting the apple and other plants; not very common in the State, and principally found in old apple orchards. The scale of the female is mussel shape, more or less curved, of a purplish brown color, with the exuviae yellowish. Length, one sixteenth of an inch. The body of the female is light yellow. The last segment presents the following characteristics: The anterior group of spinnerets consists of from eleven to seventeen; the anterior laterals and posterior laterals each of sixteen to twenty-one. The median lobes are large and wide, with the sides parallel; they are only about three fourths as long as broad. Each lobe is narrowed on each side near the distal extremity by one or two notches, and then rounded. The second lobe of each side is about as wide as the first, and is deeply incised; mesal lobule with mesal margin as long as lateral margin of the first lobe, and rounded posteriorly; lateral lobule about half the length and width of mesal lobule, and similar in shape. Third lobule obsolete. The plates are long, simple, and tapering.

The eggs are white, and are arranged irregularly under the scale. The scale of the male of this species is usually straight, and of the same color as that of the female. At about one quarter of the length from the posterior extremity the scale is thin, forming a hinge which allows the posterior part of it to be lifted by the male as he emerges. Length, .06 of an inch. The male is translucent, corneous gray, with a dorsal transverse band on each joint, and the portions of the mesothorax and metathorax darker, or purple gray, with the members somewhat lighter.

According to climate and locality the young scale hatch from the middle of March to June. Color yellow. They begin to form the excretion after twenty-four hours, and in two to four days the insect is completely covered with a dense excretion, which increases as the larva grows.

MYTILASPIS CITRICOLA.

[Figs. 3 and 4, Plate IV.]

Infests citrus trees. Found principally on imported trees.

Scale of female long, slightly curved, and widened posteriorly. Brown, with a purple tinge; the exuviae brown, with delicate margin. Ventral scale is well developed and of a dirty white color. It is a single piece attached to the lower edge of the scale, and is more or less incomplete posteriorly. Length of scale, .12 of an inch. Color of female, pale yellow. Eggs white, and placed irregularly under the scale.

The scale of the male usually straight; of the same color as that of

the female, sometimes almost black; the larval skin light yellow. For about one quarter of the length from the posterior end the scale is thin, forming a hinge which allows the posterior part of it to be lifted when the male emerges. Length, .06 of an inch.

ASPIDIOTUS PERNICIOSUS.

[Figs. 5 and 6, Plate IV.]

Infests deciduous fruit trees. Insect of a grayish color, except the center, which is pale yellow, or sometimes reddish yellow. It is circular and flat, with the exuviae nearly central. Diameter, .08 of an inch.

Body of female yellowish, and almost circular in outline; segmentation is distinct; the last segment has the following characteristics: Two pairs of lobes are visible; the first pair converge at tip, are notched about midway their length on the lateral margin, and often bear a slight notch on the mesal margin near the tip. The second pair are notched once on the lateral margin. The margin of the ventral surface of the segment is deeply incised twice on each side of the meson, once between the bases of the first and second lobes, and again lateral of the second lobe. On each side of each of these incisions is a club-shaped thickening of the body wall. There are two inconspicuous, simple plates between the median lobes, and on each side two similar plates extending caudad of the first incision; three small plates serrate on their lateral margin caudad of the second incision, and the club-shaped thickening of the body wall bounding it, and three wide prolongations of the margin between the third and fourth spines. These prolongations are usually fringed on their distal margin. There are also some irregular prolongations of the margin between the fourth spine and the penultimate segment. The first and second spines are situated lateral of the first and second lobes, respectively; the third spine lateral of the second incision, and the fourth spine about half the distance from the first lobe to the penultimate segment. Eggs white.

Scale of male dark, and somewhat elongated when fully formed. Larval skin is covered with secretion; its position is marked by a nipple-like prominence, which is between the center and the anterior margin of scale.

MYTILASPIS GLOVERII.

[Figs. 7 and 8, Plate IV.]

Infests citrus trees, and principally found on imported trees.

Resembles *M. citricola*, but differs in being straighter and much narrower, and in color is yellow, varying to dark brown. Ventral scale white, very thin, and split longitudinally, showing eggs arranged in two layers. Body of female light purple; last segment yellowish. Eggs white when first laid, but become tinged with purple before hatching.

The male scale is similar in form to that of the female, but smaller and very seldom curved.

ASPIDIOTUS CITRINUS.

[Figs. 9 and 10, Plate IV.]

Infests citrus trees mainly; only attacks the fruit and leaves.

Female scale circular, with the exuviae slightly to one side; the scale is not as convex as in *A. aurantii*; the margins are wider, and a light

gray. The ventral scale is light colored, and remains attached to the upper one, making it difficult to remove the insect from the scale.

LECANIUM ARMENIACUM.

[Figs. 11 and 12, Plate IV.]

Infests apricot, cherry, plum, etc.

Color of adult female light brown. In the center of the dorsum is a prominent, shining, circular protuberance, from which radiate a number of small ridges; these are more noticeable upon the posterior half of the scale. From the convex center to the anus is a low carina, also noticeable in front.

Length, from .20 to .27 of an inch; width, from .12 to .15 of an inch; height, from .05 to .10 of an inch. Antennæ tapering to the point, seven-jointed; joints 1 and 3 subequal; joint 2 nearly three times as long as joint 1; joint 4 slightly longer than joints 5 and 6; joint 7 is nearly the same as joint 3, and tapers to a point; a few bristles at the tip and upon each joint.

The eggs are smaller and lighter colored than those of *L. oleæ*. The larvæ are long, oval, light yellow, darker down the center, and can be distinguished from the larvæ of *Oleæ* in not having the four reddish brown marks upon the dorsum.

ASPIDIOTUS FICUS.

[Figs. 13 and 14, Plate IV.]

Infests citrus trees and shrubs only. Found principally on imported trees. Attacks only the leaf and fruit.

Scale of female circular, with the exuviae nearly central. The position of the first skin is indicated by a nipple-like prominence, which, in fresh specimens, is white, and is the remains of a mass of cottony excretions, beneath which the first skin is shed. The part covering the second skin is light red, and the remainder is much darker, ranging from dark reddish-brown to black; the thin part of the margin is gray. When full grown it measures .08 of an inch in diameter. The body of the female is nearly circular, and the color is white, with yellowish spots. Eggs pale yellow.

Scale of male much smaller than that of female. The posterior side is prolonged into a thin flap, which is gray in color.

Male light orange-yellow in color, resembling male of *A. aurantii*, but smaller, with shorter antennæ.

AONIDIA (ASPIDIOTUS) AURANTII.

[Figs. 15 and 16, Plate IV.]

Infests citrus trees; attacks leaves, fruit, and branch.

Scale circular, resembles *A. ficus* in shape, size, and the nipple-like prominence. Color varies from light greenish-yellow to reddish-brown. The central third is as dark, and usually darker, than the remainder of the scale, and when the female is fully grown the peculiar reniform body is discernible through the scale, causing the darker part of the outer two thirds of the scale to appear as a broken ring.

Female light yellow in the adolescent stages, becoming brownish as

it reaches maturity. When fully developed the thorax extends backwards in a large rounded lobe on each side, projecting beyond the extremity of the abdomen and giving the body a reniform shape.

Scale of male smaller than that of female, and the posterior side prolonged into a thin flap. The part which covers the larval skin is often lighter than the remainder of the scale. Male light yellow, with the thoracic band brown and eyes purplish black.

The eggs have never been seen excepting in the female's body, but larvæ having been found under the scale, it is supposed that the female is viviparous.

REMEDIES FOR THE DISINFECTION OF TREES IN ORCHARD.

SUMMER REMEDY FOR PERNICIOUS SCALE ON PEACHES.

Potash	14 pounds.
Caustic soda (98 per cent)	8 pounds.
Lime, unslacked	5 pounds.
Fish oil, polar or seal	10 gallons.

Directions.—First—Dissolve the soda and potash by placing them together in about ten or twelve gallons of water.

Second—Slack the lime in the barrel in two gallons of water; then add the fish oil to the lime and stir well until the lime and the oil have turned to a thick batter; then add the soda and potash, water boiling hot, and stir well with a dasher for five minutes or more; then leave standing for about four or six hours; then fill up with cold water. Do not pour in all the water at once, but about two buckets at a time; stir well as the first two buckets of water go in, to prevent lumps. Use the following day. Apply cold, one pound to the gallon of water. In dissolving it do not boil, but weigh the amount to be used, place in a barrel, and on top of it pour hot water, about one bucket to every hundred pounds of material. After pouring in the hot water, stir lively with a dasher, until it is entirely dissolved; then reduce with cold water until sufficiently thin to pass through the strainer; then place in the tank and fill up with water; stir well, and it is ready for use; apply cold.

SUMMER WASH FOR PERNICIOUS SCALE, FUNGUS, ETC., UPON DECIDUOUS TREES.

Whale-oil soap (80 per cent strength).....	20 pounds.
Sulphur	3 pounds.
Caustic soda (98 per cent).....	1 pound.
Commercial potash.....	1 pound.
Water to make 100 gallons.	

Place sulphur, caustic soda, and potash together in about two gallons of water, and boil for at least one hour, or until thoroughly dissolved. Dissolve the soap by boiling in water, mix the two, and boil for a short time. Use the solution hot.

SUMMER REMEDY FOR PEARS AND APPLES.

Caustic soda (98 per cent).....	10 pounds.
Potash	10 pounds.
Tallow	40 pounds.
Rosin	40 pounds.

Directions.—First—Dissolve the potash and soda in ten gallons of water. When dissolved place the whole amount in the barrel (fifty-gallon measure).

Second—Dissolve the tallow and rosin together. When dissolved add the same to the potash and soda in the barrel, and stir well for five minutes or so. Leave standing for about two hours; then fill up with water, stirring well as every bucket of water goes in. Use the following day, one pound to the gallon of water; apply warm.

ROSIN WASH FOR WINTER USE UPON DECIDUOUS TREES.

For Pernicious Scale and Lecaniums.

The following are the proportions of materials for the winter wash:

Rosin.....	30 pounds.
Caustic soda (70 per cent).....	9 pounds.
Fish oil.....	4½ pints.
Water to make 100 gallons.	

Directions.—Place the rosin, caustic soda, and fish oil in a large boiler, pouring over them about twenty gallons of water, and cook thoroughly over a brisk fire for at least three hours; then add *hot* water, a little occasionally, and stir well until you have not less than fifty gallons of hot solution. Place this in the spray tank and add cold water to make the necessary amount. Never add *cold* water when cooking.

LIME, SULPHUR, AND SALT REMEDY FOR WINTER USE UPON DECIDUOUS TREES.

For Pernicious Scale and Lecaniums.

The following formula and directions, if properly carried out, will produce an effective solution:

Unslacked lime.....	40 pounds.
Sulphur.....	20 pounds.
Stock salt.....	15 pounds.
Water to make 60 gallons.	

Directions.—Place ten pounds of lime and twenty pounds of sulphur in a boiler with twenty gallons of water, and boil over a brisk fire for not less than one hour and a half, or until the sulphur is thoroughly dissolved. When this takes place the mixture will be of an amber color. Next place in a cask thirty pounds of unslacked lime, pouring over it enough hot water to thoroughly slack it, and while it is boiling add the fifteen pounds of salt. When this is dissolved add to the lime and sulphur in the boiler and cook for half an hour longer, when the necessary amount of water to make the sixty gallons should be added.

ROSIN WASH FOR CITRUS TREES INFESTED WITH RED SCALE.

Rosin.....	20 pounds.
Caustic soda (70 per cent).....	6 pounds.
Fish oil.....	3 pounds.
Water to make 100 gallons.	

The directions for preparing this wash are the same as those given for the rosin wash recommended for winter use upon deciduous trees. August and September are the best months to spray citrus trees.

ROSIN WASH FOR NEWLY-HATCHED BLACK SCALE UPON CITRUS TREES.

Rosin.....	18 pounds.
Caustic soda (70 per cent).....	6 pounds.
Fish oil.....	2½ pounds.
Water to make 100 gallons.	

The directions for preparing this remedy are the same as given for the rosin wash for winter use upon deciduous trees.

WASH FOR BLACK SCALE ON OLIVE TREES.

Directions for making emulsion:

Kerosene oil (Pearl, 150° test).....	5 gallons.
Common laundry soap.....	1½ pounds.
Water.....	2½ gallons.

Dissolve the soap by boiling in two and a half gallons of water, and while boiling remove to another vessel; add the kerosene, and churn for fifteen minutes, or until a stable emulsion is formed. Afterwards dilute with six and one half gallons of hot water for each gallon of oil, and to the mixture add two and a half pounds of home-made soap, dissolved in hot water. Apply at a temperature of 140 degrees Fahrenheit.

ROSIN WASH FOR COTTONY CUSHION SCALE.

Rosin.....	20 pounds.
Caustic soda (70 per cent).....	6 pounds.
Fish oil.....	3 pounds.

The directions for preparing this wash are the same as those given for the rosin wash for winter use upon deciduous trees.

Or secure a colony of *Vedalia cardinalis*.

August and September are the best months to spray citrus trees.

GAS TREATMENT FOR SCALE INSECTS UPON CITRUS TREES.

The amount of cyanide of potassium (58 per cent) required for the different sized trees :

Height of Tree— Feet.	Diameter through Foliage—Feet.	Water— Fluid Ounces.	Sulphuric Acid— Fluid Ounces.	Cyanide of Potas- sium—Ounces.
6	4	2	1	1
8	6	4	2	2
10	8	6	3	3
12	10	10	5	5
12	14	14	7	7
14	14	16	8	8
16	16	18	9	9
18	16	20	10	10
20	16	22	11	11
22	18	24	12	12
24	20	26	13	13
26	20	27	13½	13½
30	20	28	14	14

Directions.—Cover the tree with an air-tight tent; place the necessary amount of cyanide of potassium in an earthenware vessel, pour over it

water, afterwards the sulphuric acid, and close up the tent for forty minutes.

FOR MEALY BUGS.

Mealy bugs are hard to exterminate, on account of the tender character of the plants they infest. Whale-oil soap (one half pound) and tobacco (one fourth pound) water (two and a half gallons) is the best remedy. Whale-oil soap solutions, however, can only be applied to hardy plants. Cold tobacco water (one pound tobacco, one and a half gallons water) can be applied to soft-wooded plants at any time of year. After the tobacco water has had its effect on the insects, one or two hours after application it should be washed off the plants. One or two applications will rid the plants of the mealy bugs.

The following sulphur and lime solution is also effective:

Sulphur.....	2 pounds.
Lime	1 pound.
Water	2 gallons.

Boil together for one hour, then add six gallons of water, or more water in case of very soft-wooded plants. In case of tender plants allow the mixture to cool before applying it. After it has been on the plants thirty minutes wash off with cold water.

FOR DIABROTICAS, OR SQUASH BUGS.

The best method for the destruction of the beetles is the application of a solution of Paris green—one pound to two hundred gallons of water. This application does not kill by contact, but by remaining on the leaves the beetles are poisoned while feeding upon them.

Paris green and sulphur—five ounces of the former to twenty pounds of the latter—have been used on the foliage of trees very successfully. The sulphur and Paris green are put into a sack, and the sack is tied to a long pole and shook over the trees. One application has driven away the beetles. This remedy should only be applied when the fruit is young.

FOR RED SPIDER OR YELLOW MITES.

The caustic solutions applied during winter for scale insects, and the summer remedy given below, have practically exterminated this pest on deciduous trees.

Summer Remedy.

Sulphur	3 pounds.
Caustic soda (98 per cent).....	2 pounds.
Whale-oil soap	25 pounds.
Solution (in all).....	100 gallons.

Directions.—Boil the sulphur and caustic soda together in about two gallons of water (this is done to allow the caustic soda to dissolve the sulphur). When the sulphur becomes dissolved, add the soap and boil until thoroughly dissolved, then add water to make in all one hundred gallons of solution, and apply warm.

FOR GRAPEVINE FLEA BEETLE.

Paris green is the most effectual remedy—one pound to two hundred gallons of water—but should not be used on vegetables under any circumstances, nor on fruit trees of very early ripening, unless after the fruit has been picked. Strong tobacco water is also very effectual in destroying the larvæ. Pulverized sulphur and lime (equal proportions) dusted over the plants drives away the beetles.

FOR RED-HUMPED OR LEAF CATERPILLAR ON PRUNE TREES.

The best remedy for this caterpillar is Paris green—one pound to two hundred gallons of water—but must be used when the insects are quite small, and the fruit also. The trees should be examined, and the remedy applied as soon as they are noticed. If they are allowed to increase and become large then the best remedy is hand-picking. Upon jarring the branches all the large caterpillars fall to the ground, and are thrown into a strong caustic solution, which kills them instantly.

In the bucket containing the caustic soda solution a wire basket is arranged, which fits closely down to the bottom of the bucket. Before moving to another tree, this basket is raised up and its contents (caterpillars) thrown away. In this manner the liquid does not require to be renewed often. Great care must be exercised in the use of Paris green at this season of the year; it should be constantly stirred when applying, and only used when the fruit is small.

FOR PEAR SLUGS.

Various substances have been recommended for the destruction of these slugs, and of all the remedies used none have been so effectual as the application of Paris green, the same as used for the leaf caterpillar, *i. e.*, one pound of Paris green to two hundred gallons of water. The solution must be stirred continually while being sprayed. It only requires to be strained when a fine spray nozzle is used. If a rubber disk be used in place of the brass plate, no straining is necessary, as all grains will blow through. Great care should be exercised in the time it is applied; if used when the trees are in bloom the pollen in the blossom will be washed away, and the blossoms will wither and fall off. It should never be applied until the fruit is fairly set.

FOR ROSE BEETLES.

The best remedy so far known to destroy this pest is by hunting for the beetles and destroying them. If this is done often, they can be exterminated.

FOR CURRANT WORMS AND CURRANT SPAN-WORMS.

Paris green is the most effective remedy—one pound to two hundred gallons of water, and even stronger; but under no circumstances should this be applied until after the crop has been gathered. Buhach is also effective—one half of a pound to ten gallons of water. Buhach can be applied on tender foliage without danger.

FOR ROSE SCALE ON ROSE BUSHES, ETC.

This scale is quite troublesome, and is very common throughout the State on rose bushes, blackberries, and raspberries. When blackberries and raspberries become badly infested, it is best to cut out and burn at once the old infested canes. The old infested wood of rose bushes can also be removed, without injury to the plant, and the balance of the bushes sprayed with a solution of strong whale-oil soap, one pound to the gallon of water, and applied warm. Strong caustic solutions injure the plants. The soap should be of the best. The raspberry and blackberry canes should be examined a few inches below the surface of the ground—this generally being loose, and thrown against the plants by the plow or cultivator, covers up part of the infested canes.

PEAR BLIGHT BEETLE.

The only remedy that can be recommended is to cut off the limbs when they show signs of infection, and burn them. The beetle attacks the trunks of trees as well as the limbs, therefore the trunk should be well protected. Young trees (especially when pruned high) generally suffer considerably from the sun's heat through the summer, which causes the sap to ferment and ooze from the bark, and attracts the beetle.

FOR COTTONY GRAPE SCALE.

This scale is seldom met with. A parasite keeps it in check, and on that account it does not increase. Being a soft scale, the hot sun also kills many of the young insects. During the time the vines are dormant—in the winter—the prunings should be carefully gathered and burned. The body of the vine is then sprayed with a solution of whale-oil soap, one pound to the gallon of water, and applied warm.

FOR CANKER WORMS.

The caterpillars are easily destroyed by the application of Paris green—one pound to two hundred gallons of water—but this should be applied only when the fruit is quite small. The females, being without wings, can be prevented from ascending the trees to deposit her eggs by placing on the trunks of the trees bands made of tarred paper, on which substances like printers' ink, slow-drying varnish, etc., are smeared from time to time. In ascending the tree the legs of the females become entangled and they soon die.

A good protector is made and placed on the tree, as follows: Take a strip of tin four inches wide, of sufficient length when encircling the tree to leave a space of about six inches. The upper edge of the tin is bent over so as to receive beneath it a piece of muslin as long as the tin and eight inches wide, to be held in place by pounding down the tin. The ends of the tin are bent in opposite directions, so that they can be hooked together. Placing this around the tree with the cloth upward, the cloth is to be firmly bound to the tree by a cord. In the above method the insects, which will collect in large numbers below the obstruction, may be easily killed by brushing them with kerosene oil,

without injury to the tree, unless an excessive quantity (a very little is needed) should be used.

The principal object should be to prevent the females climbing the trees in the fall. If this is properly attended to, and the trunk under the band scrubbed in the spring to destroy any eggs that have been deposited thereon, there will be no trouble from canker worms. In infected orchards, where this precaution has not been taken, the trees should be thoroughly sprayed in the winter with one of the washes recommended for deciduous trees. Should any hatch in the spring, the trees must be immediately sprayed with one pound of Paris green to two hundred gallons of water. This must be constantly stirred when applying, otherwise the Paris green will settle on the bottom of the tank.

FOR CODLIN MOTH.

The time to apply remedies against this insect is in the spring and summer. The winter work must consist in reducing the hiding places for the cocoons. As these are often many inches below ground, the soil should be removed and the bark scraped. The arsenical mixtures have proved the most successful.

Strength to be Used.—Spray early pears and apples once with one pound of Paris green to two hundred gallons of water, when just out of bloom. Spray fall and winter apples (second application) ten days later, while the blossom ends of the apples are still turned upward. Use the Paris green without any additions, simply stirring the liquid continually, straining it before using. In isolated places probably one spraying of Paris green will suffice; however, when the orchard is surrounded with infested orchards not treated, two applications will be necessary.

Possible Danger of Using the Arsenites.—The greatest care should be taken in handling the arsenic mixture, avoiding getting any in cuts on the hands, also preventing either human beings or animals from eating the young fruit. Stock should be excluded from the orchard for at least six weeks. Paris green should not be applied after the fruit has commenced to turn downward; and if an overdose be used on a tree, the foliage will be affected to such an extent that the leaves will fall, and with them the fruit.

Band System.—As an additional help in decreasing the last broods of codlin moth, the banding system is certainly worth following; but besides putting burlap around the tree about one foot from the ground, rags should also be put on trees in the crotches, and they should be examined, as well as the bands, once a week.

FOR WOOLLY APHIS.

Remedies for the Root Form.—Liberal dressing of ashes has a tendency to discourage the aphis, especially in moist localities, where heavy dews often moisten the ground.

Gaslime.—About one and a half to two shovelfuls placed around each tree in such a manner that it will not come in direct contact with the bark of the tree, is one of the best remedies. Add to this wood ashes, placed directly around the base of the tree to the depth of one inch.

Thus the migration of the aphids to the upper part of the tree can be prevented.

Remedy against the Branch Form.—When the aphid appears on the branches, their presence is noticed by their white cottony covering; the parts affected should be touched with a small brush dipped in a rosin solution; by diluting it sufficiently it can be sprayed on larger trees, being harmless to the tree. (See remedy for scale insects.)

FOR APHIDS UPON PLUM AND PRUNE TREES.

Caustic soda (98 per cent).....	1 pound.
Rosin	6 pounds.
Water.....	40 gallons.

Directions.—Prepare as directed in rosin wash for winter use.

FOR APHIDS ON ROSE BUSHES.

Spray with strong tobacco water, but must be washed off in about thirty minutes after being applied, with cold water, or dust with buhach.

FOR BLACK SMUT ON ROSES.

Use equal parts of pulverized sulphur and air-slacked lime, dusted on the foliage.

FOR SCALES ON FLOWERING SHRUBS OR GARDEN PLANTS.

Whale-oil soap (80 per cent).....	$\frac{1}{2}$ pound.
Water	1 gallon.

Directions.—Dissolve soap by boiling, and apply at a temperature of 100 to 120 degrees Fahrenheit.

FOR TOMATO AND VINE MOTHS.

The best remedy for the destruction of these caterpillars is hand-picking. The plants should be looked over from time to time, and all larvæ found destroyed. The tomato caterpillars feed upon the plants voraciously, and in a very short time strip them of their leaves. The caterpillars are so large, and as they consume considerable foliage, their damaging effects are soon observed on the vines; however, it is rarely that more than one or two caterpillars are seen upon a vine, so they are easily exterminated.

Those attacking grapevines are destroyed by cutting them in two with pruning shears, thus avoiding handling them. The best way to check the increase of these moths is to destroy all caterpillars as they are found. Where the larva becomes troublesome it is well to examine the trees or plants every day, and in this way the damage becomes nominal.

FOR THE TWIG BORER, POLYCAON.

The best remedy so far is to hunt for the infested branches, and to run a wire into the hole, and after working it around several times it will kill the beetle. The hole is then plugged up with wet clay, or soap.

If the branch does not break down by its weight it will heal over in time; but if the limb shows signs of withering, it is best to cut it off.

Spraying with Paris green—one pound to one hundred and sixty gallons of water—at a time when the Paris green cannot affect the foliage or fruit, tends to decrease their numbers; but if the larva enters the bark it is then free from any poisoning, and must then either be killed or the affected limb cut off.

FOR PEACH MOTH OR TWIG BORER.

The only remedy so far has been to remove the infected branches when found and burn them, but this seems to me impracticable. The summer remedies applied for the pernicious scale have also destroyed the larvæ of this moth, and it has thus been prevented from doing much harm.

FOR STEM BORERS.

The best remedy to prevent borers from infesting trees is to carefully guard the tree from scorching or sunburn. For this purpose a shade, three feet long, split in two and placed on the south and west sides of the tree, answers the case well; wrapping with sacks or paper is also useful. A coating of whitewash, containing some soap and sulphur, is more preferable.

FOR UNDERGROUND BORERS.

If a tree has been only slightly attacked, so that half or two thirds of the bark can be saved, it will pay to take care of it. If it goes further than this, a tree will never become thoroughly sound, and will be outstripped in growth by young trees planted later. Remove the earth at the base of the tree and wrap up the trunk with stout paraffine paper, and pile up against the paper air-slacked lime or ashes.

Whenever a borer is removed, the debris and dead wood should be entirely cleaned out and a smooth surface left, taking care to preserve the bark as much as possible. Then the wound should be smeared over with grafting wax and a rag tied about it. In this manner young trees have been saved.

It is very difficult to ascertain the presence of underground borers before the trees indicate their presence. Walnut and apple trees sometimes are observed to be bleeding (oozing sap) from a certain spot; this indicates a borer, or having been damaged otherwise. However, the cause should be carefully looked into by cutting into the bark and the borer destroyed. The wound should then be covered over with such material that will prevent the action of the atmosphere from injuring the tree.

FOR SHOT-HOLE FUNGUS.

It is only quite recently that any extensive experiments have been made to suppress this malady. Many growers have felt the attacks of this fungus but slightly, owing to late spraying in the spring of the year with the lime, salt, and sulphur remedy, as well as with other solutions into which fungicides have been added, such as sulphide of copper, sulphide of iron, hyposulphide of soda, sulphur, etc. In adding these ingredients the greatest care should be exercised that none such

be added that will be destroyed by the action of the chemicals contained in the solution to which they are added, as in such instances it cannot be expected that any great benefits can be accomplished by their use.

To secure good results the remedy should be applied just as soon as the buds begin to swell, and which must be followed by the application of fungicide solutions of a weaker kind during the growing period of the tree. The remedy should be applied immediately upon the appearance of the fungus, which is first detected upon the young fruit and the developed leaves.

FOR PEAR CRACKING AND LEAF BLIGHT.

Where the disease prevails more or less every year, it would be well to thoroughly spray the trees, before the buds begin to swell, with the Bordeaux mixture, prepared as follows:

Dissolve sixteen pounds of sulphate of copper in twenty-two gallons of water; in another vessel slack thirty pounds of lime in six gallons of water. When the latter mixture has cooled, pour it slowly into the copper solution, care being taken to mix the solutions by constant stirring.

When the leaves are about two-thirds grown a second application should be made; this time, however, using a solution containing the ingredients in the following proportions:

Sulphate of copper	6 pounds.
Lime	6 pounds.
Water	22 gallons.

Dissolve the copper in sixteen gallons of water and slack the lime in six gallons of water; then mix as described above.

The object of the first spraying is to destroy any spores of the fungi that may have survived the winter in the crevices of the bark, while the second and weaker application is obviously for the purpose of preventing such spores as may fall upon the young leaves from germinating. It would be well to repeat the application of the weaker solution every three or four weeks until the last of July or the middle of August.

The following summer remedy is used with the aim of destroying the scale upon the trees, as well as checking the progress of the fungi:

Sulphur	3 pounds.
Caustic soda (98 per cent)	2 pounds.
Whale-oil soap	25 pounds.
Solution (in all)	100 gallons.

Boil the sulphur and caustic soda together in about two gallons of water (this is done to allow the caustic soda to dissolve the sulphur). When the sulphur becomes dissolved, add the soap, and boil until thoroughly dissolved; then add water to make in all one hundred gallons of solution, and apply warm.

CHAPTER III.

BENEFICIAL INSECTS.

The insects that prey or feed upon those that injure fruit and fruit trees, plants, etc., are properly termed "beneficial." The natural fecundity of the destructive insects is so great that they could not be destroyed without their aid. Fruit growers have imported many kinds of trees for experimental purposes and otherwise, and unfortunately upon them came many insects, which developed and proved hard to exterminate, and while many effective remedies have been invented, yet they have been taxed with the heavy burden of repeating the operation no less than once a year. The cottony cushion scale once had a great run in this State, infesting citrus orchards, but its attacks were not alone confined to that class of trees, but it also attacked nearly every variety of ornamental plants, shrubs, etc.

In many cases the cost of fighting the insect with the remedies at hand was greater than the value of the production of the orchards. I remember when several orchardists offered to pay \$10,000 to any one who would invent a remedy that would exterminate the insect by one application. A reward of \$1,000 was also offered by a county, and every "tree doctor" came to compete for the prize. This not only brought out the manufacture of "cure alls," but it also agitated the minds of the scientific class, and chemists experimented almost daily with all sorts of poisons that could be applied to trees, but all this without avail. The Board held Conventions of fruit growers in various parts of the State, and these matters naturally came up for discussion. It was contended by some that as the insect came from Australia, possibly there were remedies in use there which were keeping it in check, as from all advices received the citrus trees there were not suffering from its attacks like those in this State. But our correspondents said that remedies were but little known. This, of course, appeared to the growers here as very strange, and the members concluded that there must be parasites keeping it in check. The matter of importing the parasites that might there be found was then agitated, and at our State Convention held at Riverside in April, 1887, a resolution was adopted asking Congress to appropriate a sufficient amount of money to defray the expenses of an agent to be sent by the Department of Agriculture. The efforts made by our Representatives in this direction failed, no doubt because the matter was so little understood by the members of Congress. Prof. W. M. Maskell, an entomologist of Wellington, New Zealand, in a letter under date of March 5, 1887 (Report State Board of Horticulture, 1885-86, p. 393), says: "Now, as to natural enemies. So far as our experience goes, *Icerya purchasi* has none in this country. The only coccids which I have found attacked by parasites here are some lecanids (chiefly of the genus *Tenochton*), one or two diaspidids, and a dactylopius. Birds do not eat *Icerya*, and in fact we have nothing here to check its increase to my knowledge."

This letter was written previous to the Riverside meeting, and the letter of inquiry at least three months prior thereto, as were other letters of the same tenor. The Department of Agriculture was helpless in the matter of sending an agent abroad, there being a restricting clause in the law with regard to foreign travel, and confining all investigations to America. This question, however, was kept constantly agitated, and memorials were adopted at the various Fruit Growers' Conventions held throughout the State.

Hon. Frank McCoppin, of San Francisco, was appealed to for aid, he having been appointed a Commissioner to represent the country at the Exposition at Melbourne, Australia, in 1888. Mr. McCoppin promptly responded to the request, and succeeded in laying aside sufficient funds to defray the expenses of an agent. Albert Koebele, of Alameda, was delegated on said mission, and it was he who discovered the *Vedalia*, the results of which the public are well aware. Then it is to Mr. McCoppin and the Department of Agriculture that we owe a debt of gratitude, and especially to Mr. McCoppin, for having provided the necessary funds through which the discovery was made, for without his financial aid probably the *Vedalia* would have remained unknown, except in entomological cabinets.

Stimulated by the wonderful results of the *Vedalia*'s labors, we applied to our State Legislature for an appropriation to search for other beneficial insects that may be found in the countries where many of the baneful insects among us abound. The Legislature at the session of 1891 passed an Act appropriating \$5,000, to be used by the State Board of Horticulture for such purpose. The Board applied to the Secretary of Agriculture at Washington to delegate Albert Koebele on said mission, and requested that his salary be met by the department, the Board assuming to pay all the expenses.

Having learned that Hon. J. M. Rusk, Secretary of Agriculture, had accompanied President Harrison on his trip to the Pacific Coast, I left for Los Angeles to meet him, and present our application to him in person. After an hour's consultation he agreed that this was a question of vital importance, and also said he considered it of national importance, and promised to consider the matter on his return to Washington.

This he did, as shown by the following letter:

UNITED STATES DEPARTMENT OF AGRICULTURE, }
WASHINGTON, D. C., May 29, 1891.

Mr. B. M. LELONG, Secretary State Board of Horticulture, 220 Sutter Street, San Francisco, Cal.:

SIR: I have taken steps to arrange for Mr. Koebele's mission for Australia and the adjacent islands, under the direction of this department, all of his expenses to be paid by your Board. Will you please arrange with him so as to secure the prompt payment of said expenses. His salary will be paid by this department as usual.

Respectfully yours,

J. M. RUSK,
Secretary.

Mr. Koebele sailed on the steamer "Alameda," August 20th, for Australia. Since his arrival there he has sent several consignments of different kinds of beneficial insects and parasites, which are now being colonized. Mr. Koebele reports having met with great success in discovering predaceous insects, and says that the *Orcus chalybeus* will prove equally as valuable as the *Vedalia*, and preys on the red scale, and says he will not return to America until it is introduced. He also

discovered several others, which he thinks will keep the pernicious, apricot, and black scales in check. Another very important discovery he made is of a ladybird that preys on the woolly aphis. Now that these insects have been discovered, it will be an easy matter to introduce them here, as new lots will be sent from time to time until they are thoroughly colonized.

There can be no doubt but that in course of time the fruit growers will be able to overcome most every insect pest by means of its natural enemies.

LADYBIRDS INTRODUCED.

Orcus australasiae, Boisd.



Fig. 1.

1. *Orcus australasiae*, Boisd. (magnified); 1a. Natural size. 2. Pupa enveloped in larval skin; 2a. Natural size. 3. Larva; 3a. Natural size.

Halysia galbula, Muls.

Verania frenata, Er.



Fig. 2.

Fig. 3.

1. *Halysia galbula*, Muls. (magnified);
1a. Natural size.

1. *Verania frenata*, Er. (magnified);
1a. Natural size.

Orcus chalybeus, Boisd.

Fig. 4.

1. *Orcus chalybeus*, Boisd., female (magnified); 2. Head and prothorax of male; 1a. Natural size.

Leis conformis, Boisd.

Fig. 5.

1. *Leis conformis*, Boisd. (magnified); 1a. Natural size. 2. Larva, natural size. 3. Pupa, natural size.

The following very interesting account of these species, by A. Sidney Olliff, Government Entomologist of New South Wales, is taken from the "Agricultural Gazette" (Vol. II, Part II, pp. 63-66), to which journal I am indebted for the same, and for the illustrations herewith reproduced:

"About Sydney we have quite a large number of species of *Coccinellidæ*, and among the commonest and most useful are the beautiful steel-blue species known as *Orcus australasiæ*, Boisd., and *Orcus chalybeus*, Boisd., and the orange-yellow and black-spotted *Leis conformis*, Boisd. A number of the larvæ of *Orcus australasiæ* were found by me in December last, preying upon the young of the red scale (*Aspidiotus aurantii*), a coccid insect which has been doing serious damage to oranges and lemons in the neighborhood of Sydney during the past few years. Subsequently these larvæ were reared to the perfect state in the entomological laboratory of the Department of Agriculture, where they bred freely and produced a large number of eggs. These were deposited in patches of from thirty to fifty, on the under sides of leaves. They were oval in shape, yellow in color, and attached to the surface of the leaf at their broadest end. The full-grown larva fed with avidity on the green aphid

of the apple (*Aphis mali*), and on red scale, devouring an enormous number daily. In form it is elongate, slightly narrowed behind, and provided with six rows of fleshy spines, which are covered with rather long setæ, or hairs, extending from behind the head to the posterior extremity; of these, two are dorsal—one on each side of an impressed median line; one is situated near the margin on each side, and the others are lateral; the lateral rows are much longer and somewhat stouter than the others. In color the larva is black, with a whitish median line extending throughout its length, and there is a narrow whitish line on the first three abdominal segments on each side of the middle; the fleshy spines on the thoracic segments, and on the fourth, fifth, and sixth abdominal segments, are pale, dusky yellow; the others black; at the anal extremity are four long, black spines. The coloring is somewhat variable, particularly as regards the prevalence of the white, but in all the specimens which have come under my observation black, or rich purplish black, is the prevailing hue. In length the larva measures from six to eight millimeters, or more than a quarter of an English inch. Before changing to the pupa, my specimens exuded a viscous and adhesive fluid, by means of which each larva attached itself firmly by the tail to a stem or leaf, the point of attachment being apparently just before the extremity of the abdomen; and when this was done, the larva gradually contracted in length, and increased in girth. In less than fifteen hours the creature had completed the change, and the pupa was found incased in the skin of the larva, which inclosed it as if in a swaddling-cloth, except that it was split down the middle. The pupa is reddish yellow in color, with three rows of rather large black spots on the dorsal surface, and measures from four to five millimeters in length. It remained in this state from eight to twelve days, and then the perfect insect—a brilliant steel-blue beetle with bright red spots—made its appearance. Another equally common and useful species is *Leis conformis*, which preys unceasingly on the orange aphis (*Siphonophora citrifolii*) and the American, or woolly blight (*Schizoneura lanigera*). The larva of this species is not furnished with hairy spines, like the *Orcus*, but is provided with small fleshy projections on the lateral margins. The pupa is attached to the leaf or stem by the tail, and the larval skin usually remains around the tail, but does not develop the pupa, as described above. When bred in confinement, the larval skin is sometimes thrown aside altogether, and, for all that is known, this may also occur in a state of nature. *Orcus chalybeus*, a small, bright, steel-blue species, is also an effective enemy of various scale insects that affect the fruit grower. I have myself seen the perfect insect on the camphor laurel, sucking the juices of young scale insects; and it is sometimes extremely abundant in orange orchards near Sydney. The male of this species may be distinguished from the female by having the sides of the prothorax yellow in color. *Halysia galbula*, Muls., performs a useful work farther north, and *Verania* (*Coccinella*) *frenata*, Er. [I am indebted to the kindness of the Rev. T. Blackburn for this name, and also for checking the identification of the *Orci* mentioned in this article], and a large number of other species carry on the war against aphis and plant-louse wherever they occur. Many of these ladybirds pass the winter in the perfect or adult state, hiding under bark, in crevices, among dry leaves, or any other suitable place, and on the approach of spring are ready to emerge from their resting places and begin the war anew. In cold climates

they frequently make their way into the house for shelter, and if left undisturbed will hang in clusters on the ceiling until their period of hibernation is passed.

"Of all the friendly insects none are more useful than the *Coccinellidæ*, or true ladybirds. Throughout the spring and summer they wage constant war, both in the adult and larval or young state, against the scale insects and aphides which live at the expense of our fruits and crops; and so great is their activity in destroying these pests in seasons when the aphides and scales are unusually abundant, that it may be said the cultivator owes a large part of the crop he gathers to their unaided efforts. Their voracity in the early or larval stages is really astonishing, each insect devouring an enormous number of young scales or aphides before attaining maturity. John Curtis observed that two ladybirds cleared two geraniums of aphides in twenty-four hours, and he describes the curious and skillful way in which a common English variety attacks its prey. ('Farm Insects,' p. 72. London, 1859.) One of the aphides, it seems, was seen struggling with a ladybird larva, when the latter, fearing that the aphid might escape, gradually made its way along to the wings, which were closed, and immediately began to bite them, so that in a very short time they were rendered useless, being matted together. It then seized the thorax, and, without more ado, ate into the side of its victim. The ferocity with which they attack the insects upon which they feed is characteristic of the whole group, and has been referred to by many writers; and, curiously enough, the smaller species of the family are perhaps even more fierce than their larger brethren. In alluding to this fact, Dr. T. W. Harris, one of the earliest workers in the field of economic entomology, quaintly says: 'There are some ladybirds, of a very small size and blackish color, sparingly clothed with short hairs, and sometimes with a yellow spot at the end of the wing-covers, whose young are clothed with short tufts or flakes of the most delicate white down. These insects belong to the genus *Scymnus*, which means a lion's whelp, and they well merit such a name, for their young, in proportion to their size, are as sanguinary and ferocious as the most savage beasts of prey. I have often seen one of these little tufted animals preying upon plant-lice, catching and devouring with the greatest ease lice nearly as large as its own body, one after another, in rapid succession, without apparently satiating its hunger or diminishing its activity.' ('Treatise on Some of the Insects Injurious to Vegetation.' New edition, p. 247. New York, 1890.)

"The number of ladybirds in any particular season is ordinarily proportionate to that of their victims, but after a season when the aphides and scale insects have been unusually abundant, the ladybirds make their appearance in great numbers. Sometimes, indeed, they appear in vast swarms, evidently in search of some locality where there is plenty of their food; and on such occasions it is no very uncommon thing for the crops upon which they may settle to have a bright yellow or scarlet hue, owing to the presence of thousands of these insects. In the hop-growing districts of the south of England these swarms occasionally occur, and I have myself seen them in such numbers that they had to be swept from the pathways about the houses. In seasons of scarcity, women and children collect the ladybirds in certain parts of Kent and Surrey and sell them to the hop grower, who afterwards sets them free, a practical application of one of nature's benefits, which, as far as I am

aware, is almost unique in the history of economic entomology, but one, nevertheless, that has prevailed for many years, if not for centuries. The true ladybirds are small, hemispherical, or strongly convex insects, belonging to the order *Coleoptera*, or beetles, generally red, yellow, or blue in color, and ornamented with round, or lunate spots. They are always flat beneath, and, as a rule, if the ground color is blue, the markings are red. The head is deeply immersed in the prothorax, which is more or less emarginate, or cut out in front. The antennæ are usually eleven-jointed, short, and retractile, with a more or less distinct three-jointed club. The prothorax short, transverse, with the flanks frequently concave for the reception of the antennal club. The elytra or wing-cases cover the body, and are usually glabrous, never punctate-striate or truncate behind. The legs are short, contractile, with the front tibiæ sometimes toothed, the tarsi three-jointed, first and second joints dilated, spongy beneath, the latter large and bilobed, claws appendiculate or cleft, rarely simple. More than a thousand species are known from various parts of the world, and of these many are difficult to discriminate on account of the extraordinary variability in their coloration and markings. About fifty species, representing about a dozen very nearly related genera, are known at present in Australia, and doubtless a considerable number still remain to be recorded. After pairing, the ladybird lays its eggs in patches on the stems, or beneath the leaves of a plant where plenty of aphides or scale insects are to be found, frequently placing them in the midst of a cluster of plant-lice, as if to save the young larvæ the trouble of searching for food when they first hatch. The eggs are small, oval, generally pale yellow or reddish yellow in color, and are affixed to the stem or leaf in an upright position. The patches are composed of from twenty to a hundred eggs, the number varying with different species, and apparently to some extent in the same species at different seasons of the year. The larvæ vary considerably in form, particularly in the armature of the segments, but they are always long, oval, soft-bodied creatures, with the prothorax larger than the other segments, and the body narrowing towards the hinder extremity. They are often gaily colored, and are frequently armed with tubercles, setiform appendages, or spines. The head is small, generally rounded in front, and provided on each side with three or four simple eyes or ocelli. The antennæ inserted at the anterior angle of the head is formed of three joints, of which the first is short, the second cylindrical, very long, the third extremely small, pointed. The jaws are triangular, pointed at extremity, bifid, with minute teeth at their base. The thoracic segments (those bearing the legs) differ but little from those of the body or abdomen. Nine pairs of breathing orifices or stigmata, the first situated on the side of the mesothorax, the eight others on the first eight abdominal segments; the latter are nine in number, as is usual in insect larvæ, and present below a very pointed anal opening, and a fleshy prominence used in progression. In some of the smaller species of ladybird larvæ, as in the genus *Scymnus*, for example, the body presents little cavities, disposed much in the same way as the spinous appendages of the other forms. When fully matured, and about to change to the pupal state, the larva attaches itself at the extremity of the body to a stem or leaf, and either throws off the larval skin in the act of changing, retaining it merely at its point of attachment to the tail, or the old skin is retained, loosely encasing the pupa and thus forming a protection to the animal.

In the former case the dried larval skin remains about the tail of the pupa."

NEW SPECIES.

(Discovered in California.)

Exochomus marginipennis, Le Conte (Fig. 18, Plate IV).—Found feeding upon young pernicious scale in Santa Clara County. Ground color shining black; head yellowish red; thorax with yellow margin, center black, widening on hind margin. Elytræ sub-convex, shining black, with minute red spot near the center, and a large marginal spot joining the hind margin of thorax. Abdominal segments black, legs reddish brown, pubescent.

Anatis subvittata, Mulsant (Fig. 17, Plate IV).—Found feeding on woolly aphis in Humboldt County. Ground color brownish yellow, or clay color. Head with central area black. Prothorax sub-oval, transverse; side margins broadly whitish luteous, with the whole central area black; wider on the hind margin. Elytræ brownish luteous, with two whitish spots at the base, one on either side of the scutellum, and surrounded by a black ground which forms part of the figure of its elytral ornamentation, which is that of three vittæ connected together and unequal in length and width, and rudely representing a figure 5 on each elytra. Abdominal segments brownish black; legs black. Length, .33 of an inch.

AN ENEMY TO THE BLACK SCALE.

Thalpocares coccophaga, Meyr.



Fig. 6.

The larva of this moth has kept the black scale in check wherever it has been found in Australia and New Zealand, and limbs sent with cocoons of this moth were thickly covered with old scale that had been eaten out by the larva. This moth was discovered about Toowoomba and Brisbane several years ago, and Mr. Koebele, on his former mission, sent several consignments of this valuable insect, but they fell into the hands of an agent who rather more delights in seeing insects pinned in his cabinet than in an orchard destroying myriads of scale, and he killed all that came and put the dead specimens in his collection. Thus the fruit growers were deprived of the benefits resulting therefrom. It is to be hoped that no more insects of this kind will be killed, but instead, be placed where they may have a chance of increasing, with the hope that they may become colonized, and in time keep the black scale

in check. Mr. Koebele has wisely sent collections of this moth to several parties here, and it is to be hoped that they will live and become permanently established. The following account of this moth is given by Henry Tryon, Assistant Curator of the Queensland Museum, in Report No. 1, on Insect and Fungous Pests, p. 126, 1889:

"*Thalpocares coccophaga*, Meyr.—Both at Toowoomba and Brisbane we have noticed amongst these black scales, and generally in the angles formed by the branches on which they feed, what are usually described by gardeners in both districts as 'extra fine specimens' of the pest. Examination, however, of these will soon reveal the fact that they are lepidopterous grubs, which have clothed themselves with a dark covering, and that this is interwoven with and covered by the black remains of dead Lecanidæ. Thus ensconced these grubs do from time to time consume the scale insects, and we have seen a tree almost stripped of the latter by their agency."

"This caterpillar changes into its chrysalis state in or near the position where it was first found. After a certain number of days from the chrysalis there emerges a small moth having these characteristics: It is rather small, having an expanse of wings measuring from nine to ten lines. The fore wings are elongate-triangular, with the anterior border slightly concave, the apex round-pointed, and the hind margin strongly rounded and oblique. The head is pale yellowish brown colored, the body and limbs gray, irrorated with white. The hind wings are brownish (fuscous) gray, with yellowish white bases. The fringe of the fore wings is fuscous-red, that of the hind wings is gray, and in both cases tipped with white."

THE FLY-PARASITE OF THE PLAGUE-LOCUST.

Before grasshoppers appear again the chances are that fruit growers will be better prepared to combat them. In parts of Australia for years a fly, a species of *Tachina*, has attacked the hoppers and locust, and in a short time lessening their numbers, so much so as to prevent them from doing much damage to trees and crops. It is the natural enemy of the pestiferous hopper, feeding on them as voraciously as the hopper does on vegetation. Our Entomologist, Mr. Craw, sent for some of these predatory insects last summer, but this was not the proper time of the year to secure specimens for breeding. Now that Mr. Koebele is abroad in search of parasites, etc., he has been especially requested to secure the parasite for propagation in this State. A. Sidney Olliff, Government Entomologist of New South Wales ("Agricultural Gazette," Vol. II, May, 1891, pp. 255-57), gives the following interesting account of the parasite and its work:

"Owing to the kindness of several correspondents who have been at the trouble of forwarding a number of living plague-locusts, or grasshoppers (*Pachytylus australis*, Br.), to the entomological laboratory of the Department of Agriculture, I have had an opportunity of breeding the dipterous parasite, which for a good many years past has been known to assist in keeping that pest in check. In December last Mr. J. P. Buggy referred to the existence of small grubs at Corowa, living at the expense of the locust; and subsequently he forwarded a fly which had been bred from one of these grubs, together with the information that early in February fully 60 or 70 per cent of the grasshoppers were

affected with these parasites. From an examination of a number of locusts forwarded from Corowa by Mr. A. H. Bray, I ascertained that the grub, or larva, is found within the locust, where it appears to live upon the adipose tissues of its victim, avoiding the vital parts with unfailing instinct. The grub lives indifferently in the thoracic region or the abdomen of the locust, and frequently three or four may be found in a single grasshopper.

Fig. 7.

Adult Plague-locust with dipterous larva, as yet unbred, emerging from behind metathorax; natural size.

"The grubs leave their victims when they are full grown, usually by means of an opening which they eat in the side of the locust at the point where the abdomen joins the metathorax; but they do not invariably make their exit from the body of the unwilling host at that particular place, as on one occasion I observed two grubs escaping from a grasshopper at the same time—one from between the first and second abdominal segments, and the other from between the head and prothorax. As soon as the grub makes its escape, the grasshopper, which has gradually grown more and more feeble as the inclosed parasite has gained in size, dies. In several instances I have observed that the grasshopper died before its enemy succeeded in making its escape;* and in one case a larva was seen vainly struggling to free itself from between the metathorax and abdomen of a dead grasshopper, where it was firmly held by the contracting remains of its victim. The grub, which subsequently died without extricating itself, succeeded in freeing more than half its body, but it was firmly held by the tail.

"Grasshoppers containing parasitical grubs, captured by Mr. Bray on January 22d (received by me two days later), began to show signs of feebleness on January 25th, and on the following day several of the larvæ made their appearance. On January 27th these larvæ, having



Fig. 8.

A. Puparium of *Masicera pachytyli* (magnified). A1. Same (natural size).

buried themselves at a depth of three quarters of an inch in the earth at the bottom of the breeding cage in which the grasshoppers were confined, were found to have changed to the pupal state; and five or six days later, on February 1st and 2d, the perfect flies made their appearance. This fly proved to belong to the family *Tachinidæ*, as suggested in a previous number of this 'Gazette.' The full-grown larva measured 7 mm. in length, and is yellowish white in color. It has the segments much constricted, and no distinct head. The mouth parts are very obscure,

and the material at my disposal is not sufficient for a satisfactory examination of them; but the head is provided with two spine-like processes, which appear to correspond to the maxillæ. The two spiracles on the

Fig. 9.

A. Tachina fly (*Masicera pachytyli*, Sk.), a parasite of the plague-locust (magnified).
 A1. Same (natural size).

A-2

Fig. 10.

Antennæ of *Masicera pachytyli*.

last segment are very conspicuous. The pupa is elongate, ovate, chestnut-brown in color, and measures 5 mm. in length. As long ago as 1873 this fly was known as a parasite of the plague-locust, and I find that in that year Sir Frederick McCoy referred specimens submitted to him by the Victorian Department of Agriculture to the genus *Tachina*, but up to this time no definite account of the insect has been published, so far as I am aware. Under these circumstances I thought it desirable to refer the specimens bred by me to Mr. F. A. A. Skuse, who has made a special study of the diptera, and he has been kind enough to furnish me with the following description of the species:

"*Masicera pachytyli*, Skuse, sp. n.—*Male*: Long, 2; alar, 1½ lines. Yellowish gray, with black bristles and hairs. Antennæ: third joint twice the length of the second, angular above and rounded beneath at the apex; sixth joint stout towards the base and plumose on its basal half, one third longer than the third; black, the two basal joints brown. Eyes deep purplish brown, naked. Head gray, with a dusky stripe on the front, extending to the base of the antennæ. Thorax with three very narrow, parallel, tolerably distinct, dusky stripes; metanotum blackish; abdomen short, about the length of the thorax, arched, obtusely oval, more or less distinctly tinged with blackish. Legs sordid fulvous-brown; the tarsi black or blackish. Wings hyaline, somewhat grayish; first posterior cell narrowly open (closed by the costal vein); costal vein terminating before the apex of the wing; the distance between the tips of the second and third longitudinal veins considerably longer than that between the tip of the latter and the apex of the wing; elbow of the third longitudinal vein incurved at the base with a stump of a vein; great cross-vein obliquely situated, very slightly longer than, and at a right angle with, the last section of the fourth longitudinal vein, which reaches the margin; small cross-vein obliquely situated opposite the tip of the first longitudinal vein.

"*Female*: Long, 3; alar, 2½ lines. Differs principally in being larger, blacker, with the legs entirely black.

"*Obs.*—Evidently a new species, belonging to the genus *Masicera*, to which genus it is, at any rate, provisionally ascribed.

"Mr. J. R. Garland found this same fly in great abundance at Wagga Wagga in January, and Mr. G. V. Rahn met with it at Germantown. I found a second and much larger dipterous larva in each consignment of locusts, which appears to differ materially from the other species. One of these specimens unfortunately died before reaching maturity, but a second, evidently belonging to the same species, is still alive, and

I hope to observe its transformations. The accompanying figure will give some idea of its form.

"At present I shall refrain from speculating as to its affinities; but I shall be glad to receive living locusts affected with either of these parasites, as I am anxious to work out their life history in detail."

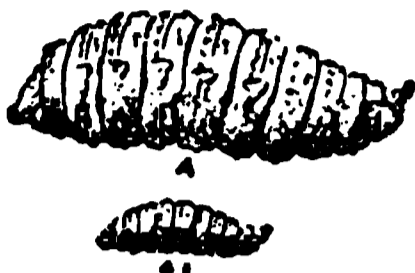


Fig. 11.

A. Larva of dipterous fly, not yet bred, parasitic on the plague-locust (magnified).
A1. Same (natural size).

YELLOW SCALE PARASITE.

(*Coccophagus citrinus*.)

For a number of years the principal orange groves of San Gabriel were infested by a scale of the genus *Aspidiotus*, which did considerable damage to both fruit and foliage. It kept on spreading every year, and remedies did not seem to check its progress. In the spring of 1889 our attention was called to the general decrease of this scale, and a request having been made upon the Board to have the cause of such decrease looked into, Mr. Alexander Craw, the Entomologist, was detailed to make an examination. He did so, and in Bulletin No. 57 are his conclusions upon the same. Since the publication of said bulletin, however, it has been considerably commented upon, and has been characterized as premature; that is, the cause of the decrease of scale has been attributed to other causes, such as excessive rainfall, disease among scales (what absurdity), and others.

We received a letter from a County Board of Horticultural Commissioners saying that the bulletin had done them a lot of harm, that people could not be made to spray their trees where any of these parasites were found, and greatly feared that their services would no longer be required. Another Commission, from a county where the parasite has not yet appeared, wrote, urging further investigations, and said: "Do not be discouraged in your work; the field of investigation and advancement is wide open before you, and will be for generations to come."

The Yuba County Board of Horticultural Commissioners, in their report to the Supervisors, said: "A parasite that preys on the yellow scale (the kind that infests Marysville trees) has been recommended by the State Board of Horticulture for importation as a check to the advance of the scale. Our Commission has investigated the work of this fly in Southern California orange groves, and have concluded that it has not done the work attributed to it, and therefore is not entitled to the prominence given it by the State Board."

Personally, I do not know the extent of the investigations claimed, but I am reliably informed that it was only a one-day casual inspection by one of its members in a few orchards. I am also informed (by one of the members) that the report was made without the sanction of the other members of the Board. To arrive at such conclusions of a microscopical insect as this is, and so minute that the aid of the best and

most powerful instruments is necessary to determine its work, requires the trained eye of an expert, and many months of constant investigation and study.

It would perhaps be best to not notice such ridiculous statements, but as they were given wide circulation under the guise of "Horticultural Commission," I addressed the following communication to prominent growers of San Gabriel, and whom I know are competent to deal with the subject:

OCTOBER 6, 1891.

DEAR SIR: You are no doubt aware of the injury done by the yellow scale throughout the San Gabriel Valley for a number of years, and its decrease in the past few years. It was to determine the cause of this decrease, and the bright fruit sent out from the San Gabriel Valley, that Mr. Alexander Craw, the Entomologist, was detailed to make an examination. His conclusions were published in Bulletin No. 57, of which I inclose a copy. Mr. Craw attributed the cleanliness of the fruit, and also the healthy appearance of all orchards in the San Gabriel Valley, to an internal parasite, which he described in said bulletin. Since that time his report has been commented upon as premature, and the results attributed to various other causes; but it will be noted that those who have criticised his report were not acquainted with the facts. I therefore beg of you to give us your experience with regard to same.

I desire such facts as I may obtain from you and others that will establish the real cause of the decrease of scale, and increase of bright fruit and healthy orchards throughout the valley.

Their answers are entitled to the greatest consideration, and I accordingly give them in full, as follows:

LOS ANGELES, CAL., October 9, 1891.

B. M. LELONG, Esq., 220 Sutter Street, San Francisco:

DEAR SIR: Yours of the 6th instant to hand, with inclosed Bulletin No. 57. There is no doubt of the correctness of the conclusions arrived at by Mr. Craw in regard to the value of the parasite working on the yellow scale in the San Gabriel Valley. I have not as yet personally examined any orchards outside the Duarte district, but the reports from other districts confirm what I have noted there. The yellow scale has decreased within the last two years at least 75 per cent. The orchards that have been sprayed are in much worse condition than others that have been left alone. In general, the trees are in better condition and have a finer crop than they have had since the scale first attacked them. No doubt the more generous use of fertilizers and better cultivation has much to do with this, but there is no doubt but that the parasite has done the most towards putting them in the fine condition they now are. I do not expect that we shall ever be entirely free from the scale, but I am convinced that with proper cultivation and the assistance of the parasite we shall be enabled to keep the pest in such control as to be practically harmless.

Yours truly,

JOHN SCOTT,
County Horticultural Commissioner.

LOS ANGELES, CAL., October 10, 1891.

B. M. LELONG, Esq., Secretary State Board of Horticulture:

DEAR SIR: Your communication of October 6th, asking for my experience with what is commonly known as the "yellow scale," is at hand, and in reply thereto I beg to state that the yellow scale first made its appearance in my orchard at San Gabriel in the fall of 1883. From that time on until the fall of 1887 I sprayed continuously with all of the substances in common use for such purposes, but without making any headway against the pest. In the fall of 1887 I concluded to abandon the spraying and see what the result would be. I received my first colony of Vedalia, the white scale parasite, on April 16, 1888, and while its efficacy as an eradicator of the white scale was then undoubtedly established, I took but little interest in its introduction, because I felt that with it removed I still had an unconquerable foe in the yellow scale. The white scale, as you well know, vanished before the inroads of the Vedalia, and while some portions of my orchard looked worse from the effect of the yellow scale during the summer and fall of 1888, other portions visibly improved. On July 31st, with Colonel Dobbins, of San Gabriel, and Professor Coquillett, I visited A. B. Chapman's orange grove, and also the Cogswell grove at Sierra Madre. In both of these orchards we found the *Coccophagus citrinus* in large quantities, and found the trees generally improving.

After visiting the groves above mentioned we then went to my place, and, while there, Professor Coquillett found one of the yellow scale parasites. From that time on I could find them scattered here and there throughout the orchard, and during that fall and spring I carried large quantities of them from A. B. Chapman's and Colonel Dobbins'

orange groves, placing them in my trees, adhering to branches brought from their places.

In the summer of 1889, in addition to the parasite above mentioned, I discovered on my place a bug differing to some extent from the *Coccophagus citrinus*, which was undoubtedly doing the same work as the true yellow scale parasite. Mr. Alexander Craw examined the bug, and for the time being called it the "Golden Chalcid." It is larger than the other parasite, and of a bright, golden yellow color. This parasite is much more numerous to-day in my orchard than the other is. Ever since the summer of 1888 the yellow scale has been rapidly disappearing from my place, and those trees that were at that date very badly infected are now almost entirely free from the pest. I lost but little fruit out of six thousand boxes last year on account of the yellow scale, and from present appearances will not lose any the coming season. There is not the slightest doubt in my mind that the improvement is entirely due to the presence of the parasite above named. I know there are people who sneer at this parasite, and who try to attribute the improvement to other causes; but any one with a strong glass can watch the workings of the insect and satisfy himself that they are the true destroyers of the yellow scale.

I have determined never again to start a spray pump under any circumstances in my orchard, because I feel satisfied that the true way to fight these pests is by their natural enemies. I think that the experience of all the orange growers in the San Gabriel Valley is similar to mine, and that they will all attribute the disappearance of the yellow scale to the parasites which we know are there working upon them.

Very truly,

J. A. GRAVES.

SAN GABRIEL, LOS ANGELES COUNTY, October 10, 1891.

Mr. B. M. LELONG, *Secretary State Board of Horticulture, San Francisco:*

DEAR SIR: Your letter of October 6th duly received, wherein you ask to what the decrease of the yellow scale is attributed, and further, if we agree with the report of Mr. Alexander Craw, in Bulletin No. 57.

We have watched the decrease of the yellow scale, and the working of the chalcid fly upon it, and attribute the decrease, and in many places, the total extinction, solely to the workings of its internal parasite, the chalcid fly, wherein we fully agree with Mr. Craw in his report known as Bulletin No. 57.

J. R. DOBBINS.
A. S. CHAPMAN.

KINNELOA, LAMANDA PARK, October 14, 1891.

In answer to your question about the yellow scale, I can say that my orchard, formerly badly infested, is now free. We have found the parasite that Mr. Craw speaks of destroying the scale. I know of no other cause for its disappearance. In my opinion the yellow scale parasite bears the same relation to that scale that the Vedalia does to the white scale.

I consider Mr. Craw a careful investigator and an honest thinker. I place great confidence in his statements. In the case of the yellow scale I know of nothing to confute his views.

Yours very truly,

ABBOT KINNEY.

The parasite is very small, .03 of an inch, and its benefits as a scale destroyer cannot be determined in a day's investigation; neither can any one determine its inefficiency by a casual inspection with the naked eye, nor can its increase be noted until it has had time to multiply. Thus to some, as in this instance, must appear that it is other causes that are diminishing the scale, because they cannot see the operation; that is, the parasite devour the scale in the manner the Vedalia does, or as large animals, such as the coyote, devour a lamb. Sometimes it may be well to advance theories, but to condemn on theory is a dangerous practice and should not be tolerated.

A letter from Prof. D. W. Coquillett was published in the "California Fruit Grower," September 21, 1889, concerning this parasite, as follows:

LOS ANGELES, September 11, 1889.

Editor "California Fruit Grower:"

Concerning the parasite of the red scale in the San Gabriel Valley, Acting Entomologist Howard writes me that it is probably a new species belonging to the genus *Coccophagus*. It is a minute, four-winged fly, scarcely as large as the head of a small pin; its eggs are laid singly in or upon the scales, and the larva or grub that hatches from this egg feeds upon the scale insect, and after completing its growth and passing through its preparatory stage it gnaws a round hole through the scale and thus makes its escape. This parasite occurs in nearly all of the orange groves in the San Gabriel Valley, and in some of them its work is very noticeable. This is especially the case in the large Chapman groves, in which I detected this parasite two years ago. During a visit to this grove a few days ago it was almost impossible to find any young red scales on the infected trees, while in other localities where this parasite does not occur, almost every leaf contains one or more of young scales, this being the season of the year when they are most abundant. Mr. A. B. Chapman informs me that there is less red scale on his fruit this year than there has been since first his trees became so seriously infected with these pests. I have taken the necessary steps for introducing this parasite into a locality where it did not previously exist, but it will be several months yet before the result of this experiment can be determined.

CHAPTER IV.

APPLE ROOTS RESISTANT TO WOOLLY APHIS.

In September of last year, 1890, I received the following letter from Mr. John C. Blackmore, of the "Pah Gardens," Onehunga, Auckland, New Zealand, concerning apple roots resistant to woolly aphis, or, as they are called in the Colonies, "blight-proof stocks." Mr. Blackmore says:

"In your report I notice on page 214, and in your reports of Horticultural Commissioners, the remarks on woolly aphis. I infer from these remarks that the fruit growers of California are not acquainted with the method pursued in this country to combat this great enemy to the successful culture of the apple.

"In hope that it may be of use, I send you a short history of the troubles we had to contend with in cultivating the apple in this country, until the fortunate discovery that Winter Majetin and Northern Spy apples were blight-proof. Prior to 1870 the apple tree had, for many years, been the victim of the woolly aphis in its most virulent form. Apple trees presented a most heart-rending spectacle, the trees being gnarled and knobbed from rootlet to branchlet from the abundance of the aphides. Indeed, many varieties, even with the most rigid attention, could not be kept alive. The result was that the apple well nigh went out of cultivation, and we depended upon our supply of fruit from Tasmania. Things were in this State when Mr. Thomas Lang, of Victoria, informed us that the Winter Majetin apple really did set the aphides (*S. lanigera*) at defiance, and that, in conjunction with a Mr. Treen, he was carrying out a series of experiments to test the aphis-resisting qualities of Winter Majetin and other kinds. Further tests proved that the Northern Spy possessed the same valuable resisting qualities as Majetin. The apple tree then became a matter of special study by a few cultivators, both in this part of New Zealand and in Victoria. Seeing the perfect immunity from blight which these two varieties enjoyed, both branches and roots, it at once suggested itself that if these two varieties were used as a stock to work all other kinds on, it would defy the attacks of the aphis below ground.

"About sixteen years have elapsed since I first drew public attention, through the Australian press, to the above apples as blight-resistant, and as a stock to work other kinds on, and they have stood every test, remaining entirely blight-proof. When those kinds most subject to blight were grafted on them, all below the graft have proved to be clean. It was in the roots below ground, where the aphis multiplies during autumn and harbors during winter, that formerly gave us trouble, but by grafting on Majetin and Spy all affected apples it dislodges this pest from the roots, and the cleansing of the branches of varieties very much subject to blight, and worked on them, is comparatively an easy matter where there is no harbor for the insects below ground; in fact,

varieties formerly very much subject to blight on the branches before working on blight-proof stocks, are since almost free, therefore the great obstacle to successful apple culture is removed. This was very forcibly brought to my mind a short time since, when acting as judge of fruit at the Auckland Horticultural Show. Ten years previous, when acting in the same capacity, there were only about twenty dishes of apples, but

Apple branch affected by woolly aphis. *A.* The cottony masses under which the insects are. *b.* The insects (natural size).

on the occasion I now refer to there were four long rows of tables running the whole length of the drill-shed, devoted to apples. The first table contained one thousand dishes of apples for competition—not an inferior specimen among the lot. The other tables were likewise crowded from

end to end, among them collections containing over three hundred distinct varieties, and all perfect specimens fit to compete with the best grown in any part of the world. Truly, we can say of the apple aphis, it is no longer a pest.

"In grafting on these stocks, to insure the cion not taking root, the cion or bud should be inserted one foot from the ground; all varieties form a perfect union on either stock. Northern Spy forms a mass of small fibrous roots close to the main stem. Winter Majetin roots are not so numerous, and travel a long distance in search of nutriment.

"For some time after the discovery of Majetin and Spy being blight-proof, the stock of each kind was very scarce; the ordinary propagation was too slow a process. The method I finally adopted was to side-graft, inverted, a piece of any kind of apple root, in an oblique cut, on a Majetin or Spy cutting two inches from its base. The cuttings emitted roots of their own below the inserted root; the following autumn the plants are lifted, and the piece of root that was grafted on is cut clean out, leaving, of course, the young plants now on their own roots. The method now pursued, and which was first practiced by myself on a large scale, is to propagate both Spy and Majetin by their own roots, as root cuttings, in planting the roots leaving the smallest trace only above the surface. These root cuttings make fine trees, and are fit to regraft the following spring. We also graft Majetin cions on its own roots, likewise Northern Spy, and sometimes work Majetin cions on Spy roots, or Spy cions on Majetin roots. It seems to make but little difference either way; they are blight-proof stocks, and all varieties worked on them do well.

"Our climate produces a good stock, propagated as above, fit for regrafting the following spring.

"You can further experiment with New England Pigeon, Striped Beaufin, Gravenstein, Duchess of Oldenburg, and Irish Peach. They are seldom affected with aphis; Irish Peach never.

"Any information you further desire I shall be happy to forward, and that you may experiment with these blight-proof apples, true to name, I will forward you twelve small trees of each on their own roots, free of all charge, by the next steamer."

In a subsequent letter, Mr. Blackmore writes:

"By steamship 'Alameda,' I send to you, in charge of Messrs. J. H. & Alfred Gunner, a small package containing Winter Majetin and Northern Spy apples on their own roots; also cions of a few varieties seldom affected with blight (woolly aphis), for experimental purposes, as advised in former letter. I intended sending much stronger plants, but through sickness I was unable to pack them myself, but had to request a respected friend of mine, W. J. Palmer, nurseryman, to do so for me. As two friends of his, Messrs. Gunner Bros., were proceeding direct to San Francisco, they offered to take charge and deliver at your office a small package; and so as not to inconvenience them with a bulky package, small plants have been sent. To insure their being free from disease or insect pests, I instructed Mr. Palmer to wash both cuttings and plants before packing. I shall be pleased to send again if these fail in transit, or trees, seeds, or cuttings of anything from here of use to you.

"Perfection and Lord Wolseley are valuable late kinds, the former an Australian seedling, the latter of New Zealand. The varieties of apples in the hands of growers about Auckland are very numerous, one

grower alone having introduced eight hundred varieties. The varieties of pears and plums, excepting prunes, are numerous; of peaches, a few years since there were no better varieties obtainable anywhere. Enormous crops were produced until a disease made its appearance, the nature of which is not yet known; and the large groves belonging to the natives, and those planted later on by the settlers, have died out, and a plentiful crop of peaches is a thing of the past, although there are several good kinds which have not been lost. I do not recommend their introduction into California, for fear of introducing the disease with them."

The small parcel of cuttings duly arrived, and were donated to the Agricultural Department of the State University for growth and subsequent distribution. The material was not in very promising condition.

Of course, the inference that California fruit growers do not know of the existence of varieties resisting the woolly aphis is not correct. At least ten years ago the late John Lewelling announced at a meeting of the State Horticultural Society that he had found that trees grown from seeds of Rawle's Janet and the Golden Russet were little injured by woolly aphis. The resistance of the Northern Spy has also been known, but that variety is unsatisfactory in most parts of California, and has been but little planted; consequently few have had opportunity to observe its resistance. John Rock has experimented for several years with resistant stocks, and so have others, and the fact that this is a promising direction for experiment was urged years ago. But for all this fruit growers have never done much in commercial propagation in this line, and the facts stated by Mr. Blackmore should attract much attention.

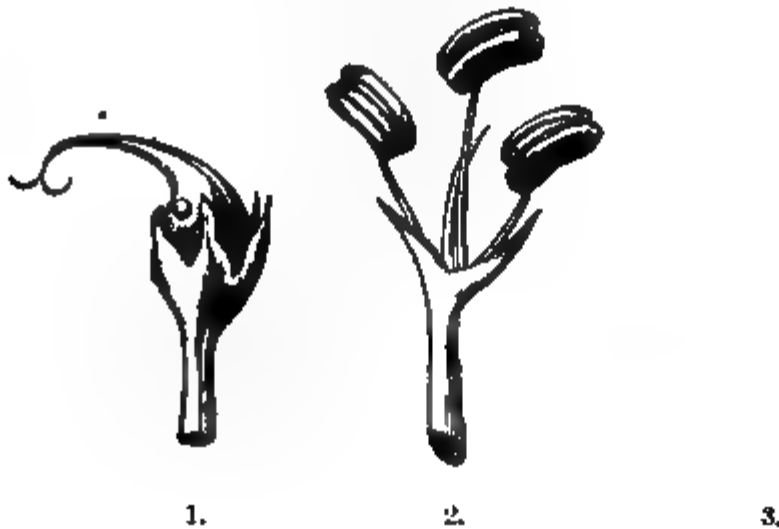
CHAPTER V.

THE BLASTOPHAGA.

FIG CAPRIFICATION, OR THE SETTING OF THE FRUIT.

"Thus we see that the flowers, which we vainly think are
'born to blush unseen,
And waste their fragrance on the desert air,'

Though unvisited by the Lord of Creation, who boasts that they were made for him, have, nevertheless, myriads of insect visitants and admirers, which, though they pilfer their sweets, contribute to their fertility."



1. A pistillate flower of the fig; enlarged.
2. A staminate flower of the fig; enlarged.
3. Longitudinal section of the fig, showing the fruits inclosed by the fleshy conceptacle.

The question of fig caprification has been the all-absorbing topic of the day among the fig growers in this State, and especially since the introduction of the fig wasp (*Blastophaga psenes*) from Asia Minor, by means of which insect it was hoped that the fertilization of the Smyrna fig could be successfully accomplished.

I listened with much interest to the lecture on the Blastophaga by Gustav Eisen, before the Academy of Sciences, at San Francisco, August 3, 1891, and expressed the fondest hopes of it demonstrating that caprification is an absolute necessity. I procured various specimens of Smyrna figs, from early spring to late fall, and carefully examined the eye, or blossom end, and could find no opening, nor even a possibility, for any insect to enter the fig. I so reported what my conclusions were at that time, and further stated that while these investigations were still in progress I did not wish to speak dogmatically, but I had so far found what seemed to me evidence that in some cases, at least of the Smyrna fig, the fruit was found to have gone beyond the point of fertilization of the interior inflorescence before there was any opening whatever in the eye, or blossom end of the fig. Even in figs quite small I found the seed formation so far progressed that the seed

had a well-defined shell, and at that time I believe the time for fertilization had passed. Mr. Shinn disputed some specimens I exhibited as not being the Smyrna, and brought me several of his Smyrna, or so called "Bulletin" figs. I carefully examined them, and also compared them with the specimens I had procured from different places, and called Mr. Shinn's attention to the fact of their being much closer, or tighter, at the blossom end than mine. Mr. Shinn could not account for this, and said, in reply, jokingly, "The insect will get in; they know their business."

The following I quote from my own report of the year 1889, page 136, to show the stand I have taken on the question; and my conclusions are not theories, but are based upon the reports and investigations of modern scientific writers, viz.:

"In the fig the organs of fructification are hidden from view; therefore we cannot tell exactly when fertilization is effected, but it is supposed that it takes place when the eye assumes a pinkish hue, and expands and admits a little air into the interior, where the flowers are.

"In many parts of Italy and the south of Europe, in olden times, cultivators paid much attention to setting the figs by the method of caprification. This practice was much believed in, but is condemned by most modern scientific writers as absurd. •

"Caprification, according to the experience of practical growers, is altogether a delusion; and many of the largest plantations of the Old World have continued to bear fruit without the aid of the caprifig.

"Professor Gasparrini, a learned botanist, carried on very extended experiments, covering a period of six years, and in an essay written for the Royal Academy of Sciences of Naples, detailed the number of experiments which he had made and repeated in different years. Their results lead to the conclusion that caprification is useless for the setting and ripening of the fruit, and that instead of making the figs remain on the tree, it either causes or facilitates their fall, especially when the insect had penetrated into the inside, and produced decay by its own death. When the insect entered a fig, the maturity of it was hastened, as apples and pears are when attacked by a grub. Professor Gasparrini recommended the abolishment of the practice, as it only entails expense, and deteriorates the flavor of the fig.

"In the islands of the Archipelago the practice has been abandoned, according to the French naturalist Olivier, but in which islands excellent figs are produced.

"The process, stripped of all its mystification, is a simple one, which, as stated before, has proved a delusion, and is only alluded to here as such. In the first place, there is a wild species of fig, called 'caprifig,' on which it is said a certain insect exists, which enters the fruit when in a young state, at the eye, thereby facilitating the entrance of light and air, or some fertilizing vapor, whereby the flowers are enabled to set and ripen. In fig plantations numbers of this wild species are planted for the sole purpose of bearing these insects; and at the proper season the fruits, with the insects, are carried and deposited on the fruit or shoots of the domestic species."

I am by no means a disbeliever of the process; but for the time being, and until the merits of the Blastophaga are proved beyond a doubt, I shall weigh with much consideration the conclusions of the authorities I have quoted, and further, because I have but recently made a very

important discovery which gives me new grounds for such a belief, which I will explain further on.

BLASTOPHAGA (PSENES) GROSSORUM, GRAY.

(*Cynips psenes*, Linn.)



Fig. 4.
Male—Magnified.

Fig. 5.
Female—Magnified.

Description.—*Female*: Average length, .08 of an inch. Wing expanse, about .11 of an inch. Color light brown. Antennæ clavate, ten-jointed, covered with fine hairs. Head sub-globose. Eyes very large and prominent, of a dark color. Thorax long. Abdomen elongate acute, terminating in a long, hairy ovipositor, three times the length of the body, two thirds of the terminal portion of which is divided into three parts. On the under side of the abdomen is a process. Wings transparent, pubescent, with long marginal hairs. The stigma of the anterior wing at right angle from marginal costa. The legs are of the same color as body, and covered with stout hairs. The tibia of the front legs is stouter than that of the second pair. The posterior legs are much stouter and longer than the others.

Male: Length, about .07 of an inch. Wing expanse, about .11 of an inch. Color black. Antennæ clavate, eleven-jointed, hairy. The scape is much larger than that of the female. Head same as female. Eyes dark and prominent. Thorax about as long as abdomen. Abdomen obtuse, with a short curved stylus. Wings and legs same as those of female.

The credit of the introduction of this insect into the State belongs solely to Mr. James Shinn, of Niles, and as to how it came about, I cannot do better than give Mr. Shinn's own statement, viz.:

"We wrote to some friends that were known to us in Smyrna; or rather some missionaries were stopping at my house, and seeing that my figs did not bear, and that I was getting uneasy about it, one of the ladies—my wife's sister—said she knew a lady from Syracuse, New York, who was then in Smyrna, and if she would write to her she would fix up a few of the fig cuttings and send them. The lady sent for them, and instead of sending a half dozen cuttings, sent a whole box of cuttings, on which I paid about \$100. After I received this box here comes another little box, and a letter saying: 'The figs must be caprifigged, if not

you will get no figs. I sent you a little box of figs that are full of the Blastophaga, and hope you can do well with them.' The moment we got them my son went out to the caprifig tree, opened the box and set it out there. Some of the insects were dead, and some were alive. I saw Mr. Eisen the next day, and told him about the Blastophaga and the figs. He and Mr. Maslin came to my place the Sunday following, July 26th. We examined and found some live insects, but most of them were dead. The Smyrna figs that were caprifigged, that is, that had the pollen put in artificially, came to perfection, but no others did. Two crops have all gone to the ground, and are now on the ground, except about ten figs. The pollen that was injected into the figs was from the caprifigs grown on my place at Niles. There are two varieties of the Smyrna fig. One has a three-lobed leaf, and the figs small and elongated. The other is a five-lobed leaf, and the figs are flat and roundish."

ARTIFICIALLY CAPRIFIED FIGS.

Mr. Shinn then exhibited three figs which were caprifigged by means of a quill toothpick*—two roundish and one elongated. In answer to a question as to the openings of the figs at the time they were fertilized, Mr. Shinn could not remember, but said: "The insect knows how to get in if it must; that is a provision of nature. Only the figs that were caprifigged have come to perfection; the others all dropped off."

QUESTION: Were those figs caprifigged by the insect, or artificially?

MR. SHINN: Artificially.

Q. Then there is no fig that has come to maturity known to have been caprifigged by the insect?

MR. SHINN: None at all.

Mr. Maslin, who was present, was requested to state his views and observations, which he did, as follows: "On July 26th I went over with Mr. Eisen, at his invitation, to examine the Blastophaga. We met Mr. Shinn's son, who pointed out to us a fig tree which he said was a caprifig, and one of the importation made by the San Francisco 'Bulletin' Company. The others in the rows belonged to the edible fig. We found in the boughs of that caprifig tree the box containing the caprifigs imported by Mr. Shinn, with quite a large number of dead Blastophaga. Mr. Eisen cut open the dried caprifigs, and found them literally black with the insects, which began to move, but very sluggishly. The size of the insect is about one line—one twelfth of an inch. We then took some of those insects and scattered them at the so called blossom end of some of the caprifigs and some of the figs known as the 'Bulletin's' importation. Mr. Eisen then proceeded to fertilize some of the figs. We found that the fallen caprifigs from the growing tree on the ground were full of pollen. Cutting them open, Mr. Eisen dusted the pollen about the open end of various figs. I suggested to him that we should insert the pollen by means of a toothpick. I picked up a fig and dusted the pollen into my hand, filling the toothpick with the pollen; and he inserted the toothpick into several figs. We pollinated several figs with the pollen of the caprifig; then went around at the end of the row and proceeded down toward the south and pollinated, probably, twenty figs in several places, selecting such figs as showed growth. We then

*This operation was first conceived of by George C. Roeding, of Fresno, and thus matured Smyrna figs in 1890, and also in 1891.

Fig. 6.

FIGS GROWN AND EXHIBITED BY MR. SHINN.

1. The large *Smyrna*, flesh amber color. 2. The small *Smyrna*, flesh dark red.

tied a string at each place below the fig that was pollinated, so as to find them afterward."

QUESTION: Mr. Eisen claims to have inserted a quill into an edible fig, and when he withdrew it that there were *Blastophaga* at the end of the quill. He so stated in his lecture on the *Blastophaga*.

MR. MASLIN: I recollect that on a tree next to the caprifig there was a *Blastophaga*; but I doubt the correctness of the statement, because we were not looking for any insect in the fig, and you don't generally find something you are not looking for. We were not looking for insects.

Q. How large were the figs you operated on?

MR. MASLIN: About one and one half inches long and one and one fourth inches thick.

Fig. 7.

FIGS SHOWING THE MATURED FRUIT IN THE RECEPTACLE.

- 1, 4. Sections of *Bmyrna* figs artificially caprifigged, showing the cavity made by the insertion of the quill toothpick with which the pollen of the caprifigs was inserted.
- 2, 3. Small or immature figs, showing the female flowers in the receptacle, and the size the mature figs were at the time the pollen was inserted, also, the closeness of the blossom, or eye, of the fig at the time fertilization is said to take place.

Q. How were the openings of the figs at that time?

MR. MASLIN: To the eye they were not open; closed as tight as tight could be.

Q. In your opinion, was it possible for an insect to get in?

MR. MASLIN: That I could not say; but I was particular because I am interested in that question. I particularly looked to see if I could find a fig where the insect was in; but I declare I never saw a fig where

it seemed possible for an insect to enter. When I took a bottle of these Blastophaga to my ranch, and went over the ten acres, I found only two figs with a hole big enough to put an insect in, and I put the insects into these, but the figs have fallen off.

Q. Was the pollen used taken from California-grown figs or from the imported?

MR. MASLIN: From caprifigs grown by Mr. Shinn. I have ten acres of Smyrna seedlings. I sowed the seed in 1885 and 1886. The first crop this year the fruit on the limbs was very thick, as on plum and prune. The figs this year, of that crop on the trees that were grown from seed, are big, but had no saccharine matter in them, and dried right up. About two weeks ago I found two dozen little figs on current wood, being so called second crop. They were of a lovely cream, ivory color. The meat was amber color and very sweet, but not filling the receptacle. It only showed that there was some saccharine principle being developed.

AN IMPORTANT DISCOVERY.

The ground for argument by those who believe in caprification has been that no fertile seeds had been found in any California-grown fig. Also, that all figs, and especially the Smyrna, only contain female flowers; and the fact of fruit of trees imported from Smyrna not com-

Fig. 8.

CALIFORNIA-GROWN FIGS WITH FERTILE SEEDS.

1. Specimen showing mature fruits. 2. Specimen showing how the fruits lie in the receptacle; the male flowers are towards the blossom end.

ing to perfection, gave them stronger grounds for such belief; that is, the pollen of the male, or caprifig, had to come in contact with the flowers of the female fig to produce fruit. Also, that the reason of not having found kernels in the seeds of California-grown figs was attributed to the lack of the pollen fertilization.

On October 20, 1891, while visiting an orchard at Los Gatos, I came across a tree which attracted my attention, by reason of it being of peculiar foliage; and upon cutting the fruit, I found that it possessed both pistillate (the female organ of a phænogam, consisting of the ovary with its stylus and stigma) and staminate (the pollen-bearing organ of the flower, consisting of an anther usually supported upon a stalk or filament) flowers, which were so grouped that the pollen from one was freely conveyed to the other. Thus fertilized the female blossoms had developed into hundreds of perfect seeds with well-defined kernels.

This is the first time that fruit of this character has been found in this State, that is, containing both pistillate and staminate flowers, and the seeds perfect kernels. One of the specimens cut in the presence of E. W. Maslin, Secretary State Board of Trade, and G. F. Weeks, Agricultural Editor of the San Francisco "Chronicle," was full of pollen; in fact, the pollen was so abundant that it gave the center of the fig a yellow appearance. Unfortunately the figs were not fully matured, so there was no opportunity to test their quality. On cutting them open they were of a decidedly purple hue near the skin, changing to bright red and to deep red in riper specimens. Hardly any red coloration was visible in greener specimens, the entire flesh being a deep purple. The fig is of elongated shape, rather small, and resembles the elongated fig grown by Mr. Shinn, both in shape and color of flesh. It has a leaf resembling the Smyrna, finely lobed.

Since the above was prepared Mr. Maslin brought to my office (November 9th) several seedling Smyrna figs grown by him in Placer County. The specimens were small, of a bright amber color, and the fruits in the receptacle well developed and ripe. Upon examination they were found to contain numerous male flowers and considerable pollen. We have here two conclusive facts showing that the insect is not altogether essential for the setting of the fruit, in some figs at least.

This is a progressive world, and its people, step by step, have unraveled many of the most difficult problems, so let us hope that wisdom and ingenuity will in the near future solve this interesting question.

The question of caprification, which at present is attracting so much attention, has been most ably expounded by Professor Gasparrini, referred to elsewhere, and the following is a translation from the Italian, of his essay:

ON THE CAPRIFICATION OF THE FIG.

[The Royal Academy of Sciences of Naples proposed as the subject of an essay:

1. To examine the opinions of authors on caprification, above all, those of Cavolina and Gallesio, and to see what were the merits of the ideas and experiments of these men.

2. To describe the varieties of figs, especially those on which caprification is practiced.

3. To prove by experiment, or on anatomical or physiological grounds, whether the fertilization of the seeds is affected by the insect of the caprifig, or whether the insect produces no such effect and caprification be useless.

4. The essay to be accompanied by figures representing the varieties of fig on which the experiments are made, and the structure of their organs of fecundation and fructification.

Gasparrini's memoir in reply is divided into four parts. The first contains a detailed physiological account of the caprifig and its different varieties, which he considers not only specifically but generically distinct from the cultivated fig, including a detailed history of the fly bred in its fruits.

The second is a similar account of eatable figs cultivated about Naples.

The third (here translated) relates specially to caprification.

The fourth is a botanical comparison of the fig, the caprifig, and some exotic species.—B. M. L.]

1. *Historical Notes on the Subject.*—Herodotus informs us in his histories that the Babylonians knew of old that there were male and female date trees, and that the female required the concurrence of the male to become fertile. This fact was also known to the Egyptians, to the Phœnicians, and to other nations of Asia and Africa. The ancients were acquainted, moreover, with several circumstances proved by experience relative to the diversity of sexes in plants, like the one just mentioned of the date tree, and among these dioecious plants they distinguished the female as being the one that bore fruit. And in other cases where they suspected a diversity of sexes, not having any fixed rule or sufficient science to guide them, they judged merely by external *facies*, by medicinal virtues, or by other such fallacious or slight indications. If it may not indeed at all times have been universally believed that all things endowed with senses or life are reproduced by the concurrence of sexes, yet the ancients, although they could not detect either the sexual organs of plants or the fact of their fecundation, nevertheless seeing them at certain periods of their life clothed with elegant flowers, perfumed with various essences, distilling delicious nectars, all radiant with glory, as if prepared for some ceremony of proportionate importance, they judged by the rules of common sense and analogy that this was the period of their loves, and that there must be amongst them all, according to the laws of nature, a male and a female. Thus, with regard to the date tree, the Babylonians, either imagining or finding by experience that the great distance of the male was often an impediment to the fecundity of the female, they suspended to the latter male flowers brought from a distance; and they believed that the fertilizing power of these male flowers resided in the small flies which they harbored, and which, introducing themselves into the female flowers, caused them to set and to ripen. This operation, called *palmification*, is still in use, and reckoned necessary for obtaining fruit in the country where the date tree grows naturally. If we could establish with certainty that this theory of the date tree was current before the facts were known concerning the fig, we might well suppose that the earliest Greek cultivators, seeing the caprifig always sterile (in so far as that the fruit does not become sweet), with a coarse and wild habit, and seeing the quantity of little flies it produces, should have thought that that was indeed the male, and that the fertility of the real fig depended upon it, and that thus taking example from the date tree the custom should have originated of suspending the flowers of the caprifig to the domestic fig tree. But the memory of this custom is even more ancient than that of the palmification of the date tree. This *caprification*, as it is called by us, is spoken of by the most ancient Greek writers on natural history; it is alluded to by Aristotle, and minutely described by Theophrastus, writers

who were not only superior to all others in their philosophical speculations, but were very ingenious in their ideas on natural objects and phenomena.

Aristotle observes that a certain insect is generated in the flowers of the caprifig, which, having become a fly, enters the unripe fruits of the domestic fig and causes them to set, for which reason cultivators always plant the one by the side of the other, or suspend the fruits of the one to the branches of the other. Theophrastus does not confine himself to this bare statement of the practice which prevailed, but discourses at length on the manner in which the little fly could produce this effect, whether by opening or by closing the aperture of the fig. He rejects the second theory and pronounces for the first, saying that the fly by continual nibbling enlarges the mouth of the fig and sucks out the superfluous humors, and that the air penetrating through the aperture, it follows that by its warmth and fermenting qualities the fig sets and ripens. Nevertheless there are races of domestic figs which do not require the aid of the caprifig to ripen, and treating of these, this diligent observer is of opinion that this may arise from the quality of the soil or of climate as well as from the particular nature of certain figs which can ripen their fruits without assistance. He believes that a poor dry soil with a northern aspect, the deficiency of moisture in such soil, the cool wind which is usual in such a situation, and even the dust which would cover the fruit and absorb its superfluous humors, would all tend to open the mouth of the fig and produce the same effects which in the other case are brought about by the flies, and that if in Italy and some other countries caprification was not known, it was because, for the above reasons, the figs in those countries set and ripened naturally; and Pliny, speaking of this subject, says that the caprifig is of a wild nature, and does not ripen its fruit, but that it imparts to the fig that virtue which it does not itself possess, for such is the course of nature, that even from putrefaction something should be generated. It produces midges, which, deprived of any nourishment from their own parent, fly to the allied fig, and by continual biting at the mouth enlarge it, and, penetrating within, facilitate the admission of light and fertilizing air (*aura cerealis*), thus transforming the milky humor into a sweet honeyed juice. On this account the caprifig should be planted near the fig, and on that side from whence the wind might carry the fertilizing breath. Now, this description is but little more than a copy of what Theophrastus had written so long before. These were the opinions of the learned as well as the usages of the country in the times of Herodotus, Aristotle, Theophrastus, Dioscorides, and Pliny; but however ancient was the practice in Greece, it remained there; for there is no tradition of its having been introduced into Syria or Palestine; and Pliny remarks that even at his time it was only in use in the islands of the Archipelago. It may, therefore, be affirmed with tolerable certainty that it was only brought from thence into our country (Italy), although, owing to the long rule of barbarians, it is impossible to fix the period of its introduction with any degree of probability.

After the revival of science, Cæsalpinus, about the year 1583, discovered the sexual organs in flowering plants, and thus the conjectures of the ancients became a certainty. Nevertheless, the opinions on the effects of caprification did not change in the least, and none of the botanists or agriculturists of the time, who treated of the fig, differed

in this respect from Theophrastus, as may be seen in the works of Bauhin, who lived many years after Cæsalpinus. In the beginning of the last century, Tournefort, traveling through Greece, endeavored to ascertain the details and the effects of caprification, and whatever he saw and noted down he afterwards published. He follows the opinion of the Greeks with regard to the manner in which the effects may be produced, saying that the caprifig produces three kinds of receptacles (as we have elsewhere explained in detail) and three generations of the fly in the course of the year; that there are eatable figs which require the assistance of the caprifig to set; that the virtue of caprification consists in the bite of the insect, which, by enabling the superfluous milky juice to escape, causes the fig to set and ripen, and perhaps also some liquid issuing from the fly itself produces the saccharine fermentation by combination with the juice of the fig. Pontedera afterwards, in making known the structure of the flowers, as well of the caprifig as of the fig, states his belief that the fly acts upon the latter by giving admission into it to light and air. All which statements differ in little or nothing from the opinions of the Greeks.

Meanwhile the discovery of Cæsalpinus, in the commencement of the preceding century, had more than ever attracted the attention of the learned, many of whom admitted the necessity of sexes for the fecundation of fruits, and especially for the purpose of obtaining fertile seeds, yet there were not wanting those who contradicted it, and amongst other grounds adduced the fig as ripening its fruit without fecundation. But the most sensible observers multiplied the facts relating to the fecundation of vegetables; they ascertained that the female date was enabled to set and ripen its fruit, not by the insect, as Herodotus believed, but by the fertilizing powder of the anthers; and, amongst other remarkable circumstances, this also was discovered, that certain animals and vegetables lived under a kind of mutual dependence for the accomplishment of the operation. Thus, for example, it was observed that the male flowers of the gourd abounded in pollen, which is their fertilizing powder. With this pollen bees chiefly form their wax, and the bee flying from flower to flower carries it from the male to the female flower, which eagerly sucks it up, becomes fertile, and grows into the fruit. These facts and other similar ones having been related and proved, it appeared to the learned, and especially to Linnæus, that they explained the whole secret of caprification. This great botanist well knew that the fruit is the enlarged ovary, and that the fig commonly called a fruit is not the ovary, but a receptacle containing the flowers, and capable of enlarging without the assistance of fecundation. Knowing, moreover, by the researches of Pontedera, that the domestic fig only contained female flowers, and that the males were in the caprifig, and that in the one, as in the other, the flowers remained inclosed withinside the receptacle, he conceived the beautiful idea that the fecundation of the fig took place by a special provision of nature. This consisted in the creation in the caprifig of an insect which, for the purposes of support and propagation, was obliged to penetrate into the domestic fig, and carried with it the prolific humors. Thus fertilized the embryo was produced, and the greatest number of the receptacles remained on the trees, and came to maturity. In reply to those who followed the opinion of Camerarius, who said that the seeds of the fig never germinated, as well as to those who alleged on the contrary that fig trees

could be only raised from the seeds of figs of the Greek Archipelago, or of Italy, with the remark that the statement of Camerarius was correct in regard to seeds produced in Germany, France, or England, where, there being no caprifig, the figs remained necessarily sterile, whilst, on the contrary, in Greece and Italy, where the caprifig existed, the fig seeds became fertile, either naturally or artificially, by means of caprification, this explanation appeared so just and natural that it was generally adopted.

2. *Concise Exposition of the Theory of Cavolini.*—Towards the close of the last century, Cavolini, who was in natural sciences the pride and ornament, not only of Naples, but even of the whole of Italy, sent to press a learned treatise on the present subject. He first describes the caprifig and the fig; then observes that they are but individuals of one species, the caprifig being androgynous and the fig the female plant; and he proceeds to endeavor to prove the necessity of caprification. The fig, he says, is a receptacle, or “a portion of the branch prolonged for the purpose of fructification, and not a pericarp, which is the external covering of the seed. The receptacle can support itself and attain its perfection without fecundation; but not so the pericarp, on account of its adherence to the seed by means of its vessels.” Nevertheless, he afterwards declares that this theory is not in all cases confirmed by fact, alleging that the receptacle of the strawberry, of the mulberry, of the blackberry, and of other plants, does not grow or become succulent till after the fecundation of the pistil. And from these data he argues, as to the mode in which caprification works, as follows: That which is commonly called the fruit, is a dilatation of the branch and bears the flowers; but being different from the real branch in internal structure, the nutritive fluids meet with difficulties in passing from the large direct channels of the branch into the vessels of the receptacle, which are of a different structure and direction. On this account they would soon drop off if the female flowers were not fertilized; but as the fecundation induces an affluence of humors to the ovary, and thence to the receptacle, it follows that the one and the other continue to grow. And as this defective structure is greater or less in different sorts of figs, so (extrinsic) fecundation is necessary in some, superfluous in others, whilst others only require a very little of it. And if the same fig at Naples, for example, may require caprification, and not require it at Capri, it is because in the latter place the soil, reduced to the finest dust, and the air loaded, the one with alkaline salts, the other with phlogistin, could produce the same effect; that is, the setting and ripening of a large quantity of fruits. Thus it is that in certain places caprification is entirely unknown, as in the promontory of Sorrentum, Ischia, and other districts. Believing, therefore, that fecundation was necessary to sustain the domestic fig till its maturity, and that it contained only female flowers, whilst those of the caprifig were androgynous, with perfect anthers, it followed naturally that the fly coming from one to enter the other should carry with it the pollen or the fertilizing essence. He, consequently, thought it worth while minutely to describe the insect in its various states. Such is, in brief, Cavolini's theory of caprification, which we should have given in detail did it not appear to us to be too prolix and somewhat obscure.

3. *Exposition of the Theory of Galesio.*—Galesio, not long dead, has left a large treatise on the physiology of the fig and on caprification.

We have extracted from it in their proper places whatever appeared to us of the most importance on the fig and on the caprifig, and we now proceed to state this author's opinion on caprification. He admits with Theophrastus, Pliny, and so many others, that there are figs which mature their fruits naturally, and others that require caprification. This difference was attributed by the ancients to climate and soil, believing that in a poor soil, with a northern exposure, the fig could nourish and mature its fruit without the caprifig; Gallesio, on the contrary, affirms that it proceeds from a difference in organization, that the fig requiring the caprifig is quite a different kind from the others, and that both preserve their character and temperament in any soil or climate which they can bear. Now, the diversity in their organization, according to him, is this: Some figs have no flowers capable of being fertilized, as their ovaries are without ovules; these produce no fertile seeds, and cannot feel the action of the caprifig, which they do not stand in need of to preserve and ripen their fruit. These he calls *mules*, and says it is they which are cultivated in Spain, Florence, and upper Italy. Other figs, called *semi-mules*, have flowers susceptible of fecundation, the ovaries being furnished with ovules. In these fecundation generates the embryo, which causes the nutritive humors to flow to it from the peduncles, which can only draw them from the receptacle; this, again, cannot obtain the nutriment from anywhere but from the stem, and thus the fecundation occasions the setting and ripening of the fruit. And as it is only the caprifig that can produce this effect, so caprification is necessary for the perfection of these *semi-mule* figs. Such are, he says, the figs of the Archipelago, and many of those of the kingdom of Naples, all producing female flowers only.

4. *Opinions against Caprification.*—There are many who will not admit that any effect is produced by caprification, and these are chiefly ignorant or simple cultivators, who judge from observing that in many places figs ripen without the coöperation of the caprifig. But with these must not be confounded two distinguished French naturalists, Olivier and Bory de St. Vincent, who have enounced the same opinion. The former, after having explained the process as practiced in Greece, adds: "This operation, of which some authors, both ancient and modern, have spoken with admiration, appears to me to be nothing more than a tribute of ignorance, which man pays to prejudice. Caprification is unknown in many parts of the Levant, in Italy, in France, and in Spain, and begins to be abandoned in some islands of the Archipelago where it used to be practiced, and which, nevertheless, still produce excellent figs for eating. If the operation were necessary, whether fecundation be effected by the fertilizing pollen dispersed in the air, introducing itself into the mouth of the fig, or whether nature make use of a little fly to transmit it from one fig to another, as is commonly believed, it is evident that the first fig in flower could not fecundate at the same time as those which have already attained a certain size, and those which are only just appearing, in order to ripen two months later." I do not transcribe the words of Bory, for his narration appears to me to be but a judicious illustration of what Olivier had stated.

And here I close the history with the following brief recapitulation of different opinions of authors on the mode of operating of caprification: The ancients believed that its virtue depended on the fly of the caprifig, which, by forcing its way into the domestic fig, facilitated the

entrance of light and some fertilizing or fermenting vapor, and enabled the fig to set and ripen, and that a poor soil and northern exposure produced the same effect. Tournefort believed that the insect made the figs set and ripen by pricking and biting them, giving an issue to the superfluous juices, and perhaps by communicating some peculiar humors of their own produced the saccharine maturation. Pontedera followed the ancients, whose theories were all based on that of Theophrastus. Linnæus concluded, from the observations of Pontedera on the structure of the flowers of the caprifig and the fig, that the latter could not be fecundated without the assistance of the caprifig, and that this fecundation enabled them to set more abundantly. Cavolini combined in some measure the theories of Linnæus and of Theophrastus, affirming that the caprifig fecundates the fig, and thereby causes it to bear more fruits and ripen them better; but that the same fig can also ripen its fruit in certain districts by the sole effect of soil and climate. Gallesio follows Cavolini in so far as regards the action and effects of fecundation, but believes that neither climate nor soil can produce anything of the kind; and that the figs which do not require caprification differ from the others in the internal structure of their flowers. Lastly, the opinion of our cultivators is nearly that of the Greeks. They believe that the caprifig is necessary for some figs, which, without it, would lose the whole or the greater part of their fruits, whilst still sour, and that it hastens the maturity even of those figs which do not absolutely require it. They also admit that the quality of the soil and climate may, in some cases, produce the same effect as caprification.

5. *Comments on the Above Opinions.*—The ancient philosophers and naturalists admitted, as every one knows, four elements—earth, water, air, and fire—the which, combined together in various ways, produced an infinity of phenomena and things. Now, Theophrastus, wishing to explain how it could happen that the fly should cause the young figs to remain on the tree, bethought himself that, whilst the fig abounded in humidity, it was deficient in the air and heat necessary for fermentation, and that the insect, by feeding, carried off precisely the superabundant humidity, and by opening the mouth gave entrance to air and heat; and as this happened naturally in a poor soil and northern exposure, there was no occasion for the assistance of the fly. But in the present state of science, who would believe in the attribution of such powers to the soil and the north wind? On the contrary, such circumstances would rather produce an opposite effect; for the want of humidity and cold tend rather to contract the parts. And if any one were to see in the *aura cerealis* of Pliny that which is now called pollen, or the fertilizing dust generated in the anthers, would probably be mistaken, for it appears to me that the epithet *cerealis* denotes nothing but fertility or abundance produced by the *aura*. The opinion of Linnæus has, in truth, all the appearance, I do not say of probability, but even of certainty, of being simple and analogous to what takes place in a great number of vegetables. And that of Tournefort, if one does not entirely give faith to it, has, nevertheless, much of probability, considering that in other fruit trees the ovary, being pierced by an insect for the purpose of depositing its eggs, does not fall off on that account, but ripens like the others, only a little earlier.

Cavolini's theory is derived directly from Linnæus, only that his explanation of the manner in which the fecundation makes the fruit of

the fig set is ingenious, and even rational. Admitting, then, for the moment, that the fact is as stated by that celebrated naturalist—that is to say, that in certain figs the nutritive juices cannot pass readily from the branch to the fruit (on account, as he says, of the extreme tenuity and curvature of the vessels), unless attracted by the embryo generated by fecundation—yet he has not shown that in the figs which ripen without caprification these vessels are really less curved or larger. Now we have proved that the structure of the receptacle in all the varieties of fig is tolerably similar. And his observation that the fine dust of the soil might produce fecundation is now wholly inadmissible. For although towards the close of the last century there were some who believed they had obtained perfect seeds furnished with embryo, by fecundating the pistil with very fine charcoal dust, later experience has entirely disproved it. As for the virtue attributed by authors to the alkaline salts of the earth, or the phlogiston of the air, as being capable of producing the same effect, it can now no longer be supported without offending the dignity and grandeur of science. Galesio's opinion is essentially that of Linnæus, as to the importance and the action of fecundation; and he follows Cavolini in admitting that certain figs require caprification, and others do not for the ripening of their fruits. But he does not see the cause of this diversity either in soil or climate, but in their different organization, believing that those figs only which have their flowers apt for fecundation require the caprifig, as well to produce the embryo as to ripen the fruit. Nothing further can be deduced from Galesio's work, in which, to my mind, there is great confusion, owing partly to preconceived and ill-defined ideas, such as that of the distinction between *mule* and *semi-mule* varieties, partly from the author not having precisely stated in what consists the diversity of structure on which he founds his theory, and, above all, from this, that he never himself saw the operation of caprification, nor examined the variety of fig on which it is performed. Moreover, his own theory, which we have perhaps stated more clearly than he does himself, appears to be in contradiction with itself in the two principal points. For if, in the variety called by him *semi-mule*, the sap of the branch passes into the receptacle, attracted by the action of fecundation and the vital power of the embryo, how is it that in the other variety the same cause does not produce the same effect? And here let us repeat that the different receptacles of the same tree, of whatever sort the fig may be, do not differ from each other in the least in the organization of the vessels, the parenchyma, and the fibers.

Such are the ideas of authors on caprification. Were we certain that Theophrastus and Pliny had intended by the word *aura* to denote the pollen, all would have joined in one general idea, that of fecundation. But in the history of the different opinions, as given above, one remarkable fact is included, which may not appear at first sight, which is, that with all the subtle fancies conceived by authors in their theories and explanations, not one of them has put forward a single experiment; but all, preoccupied with the certainty of the fact, have aspired at nothing but discovering the reason—even those who had good opportunities of actual observation. And Olivier, in denying to caprification any power whatever, comes to that conclusion not by experience, but by a just and rational operation of the mind.

But as it appeared to me not only worthy of the labor, but most essential to the consideration of the subject, to ascertain the truth by

experiment, I have applied to it all the care in my power. The questions I have chiefly endeavored to solve are:

1. Does the caprifig fecundate the flower-heads of the domestic fig, and make them remain on the tree in greater numbers?
2. Does the caprifig fecundate the female flowers of autumnal figs, and make them set?
3. Does the caprifig hasten the maturity of the autumnal figs, or of the fruit of any sort of fig?
4. Does the caprifig operate by means of the puncture made by the fly?
5. Does the caprifig operate in any other way than any of the preceding, and by any process as yet unknown?

The figs near Naples which always produce fruit are chiefly of two kinds, the Colombro and the so called Paradise fig. On two middling-sized trees—one of each of these kinds—I suspended towards the end of April some *cratiri** of the caprifig, called by our cultivators *Mamme di propichi*, or *caprifig teats*. The fly entered the flower-heads of the fig, but they did not set in greater numbers on each branch than was the case on similar fig trees not caprifigged, and growing far from any caprifig. In the ripe figs I could not find a single seed with an embryo; they were all sterile; some quite empty, others containing albumen only, and when sowed would not germinate.

At Baja the Dottato fig almost always ripens its fruit. Whoever passes by that district will readily observe places where the Colombro and the Dottato figs are so close to the caprifig that their branches intermix. Yet there are no signs among them of early maturity, when compared with similar fig grounds far from any caprifig. These figs naturally do not bring all their fruits to perfection; those that fall are at Baja called *Sbufoni*, and this usually takes place about the end of May or the first half of June.

In these fallen fruits, in the vicinity of the caprifig, there are generally dead flies, and never seeds with embryos. Out of fifty figs recently fallen from a Colombro, which I examined on June 17th, five only contained no insect; the remainder had them in greater or less numbers, but were so destroyed inside, and black and rotten, owing to the insects which had died in them, that to all appearance that was the cause of their falling. On the same tree were a number of figs looking nearly ripe, but slightly pricked and insipid, and which fell off with a slight shaking of the tree. Some of these contained insects, others did not; the former, like the fallen ones, were destroyed, and black inside. As to the permanent or set fruits, which in the middle of June can well be distinguished from the others, there were some with the insects, others without. In the fallen fruits of the Dottato fig I did not find one which had not the fly; but among the permanent ones there were some free from it. These experiments and observations were repeated three consecutive years, whilst every attempt proved vain at making the seeds of these figs germinate, though they were sown under a variety of circumstances, and at different seasons. The fly, therefore, which issues from the *cratiri* of the caprifig towards the end of April produces no effect on the domestic fig, either in fecundating their female flowers or in making

*These are explained in the first part of the memoir to be those young figs of the caprifig which first appear in September, and remain through the winter till the following spring, when they come into flower.

them remain on the trees, or in hastening their maturity. If in the latter respect a precocity may sometimes be observed, the difference is so slight as not to be taken into account, considering the diversity of aspect, the trees being more or less exposed to the sun. The size of the tree, the being single and uncovered, or choked by the surrounding vegetation, may also occasion some difference, even at very small distances. Indeed, the different branches of one and the same tree ripen their fruits at different times. That the Dottato fig should ripen its fruits at Baja is not to be attributed therefore to the caprifig planted there, but solely to the climate, or perhaps to the soil, for the same variety near Naples will produce nothing, even with the caprifig, and in other localities will do as well as at Baja without it. And on the Lardaro fig, which never ripens naturally, at least in the vicinity of Naples, although the fruit enlarge considerably, and some remain on the tree till the end of May, often as I have attached to it the *cratiri* of the caprifig, I never observed a single one ripen. Therefore, I conclude that the remaining and maturing of the figs depend upon two circumstances—the intrinsic properties or natural disposition of the variety, and on the quality of the soil and climate.

6. *Does Caprification Hasten the Maturity of Late Figs?*—In the district of Portici I made the following experiment: In a large property there were two small trees of the Sarnese fig, distant from each other about two stone throws, and about equal in size and vigor. To one of them only, about the end of June, I hung the flower-heads of the caprifig, and I counted the fruits upon each tree. In the first days of September there was no difference between them. Each had some ripe figs, some still sour, and others commenced ripening. Counting them again, there was here also no difference, each tree having lost about a fourth part of its fruits. The following year I repeated the experiment, with some modification. I marked with thread or with twine the figs into which I saw the fly had penetrated, and I took care that there was no caprifig in the vicinity of the other tree. The result of this experiment was precisely the same as that of the preceding year. In the meantime I had suspended five flower-heads of the caprifig to a large branch of a Lardaro fig which rose considerably above the rest of the tree, thinking that however little the caprifig might hasten the maturity, the slight difference would nowhere be more perceptible than in the different branches of the same tree. Yet when maturity commenced numerous fruits on all parts of the tree were in the same state as those of the branch in question. Now it appears improbable, not to say impossible, that those five caprifig flower-heads should have furnished insects enough for so great a number of figs.

I repeated the experiment for four years, and always with the same results, though in different localities. At the Camaldoli, where caprification is not practiced and the caprifig very rare, I caprifiged copiously a Dottato fig and two white fig trees, and none of the three showed the least sign of precocity. I believe, therefore, that the insect does not at all hasten maturity. It must only be observed that maturity is not to be confounded with a certain early softening which happens to some of the deciduous fruits pierced by the insect. For, as will be seen hereafter, the fly destroys and corrupts the inside of the fig; when it is already disposed to fall, it falls the earlier, and by rotting inside becomes soft the sooner.

7. *Does Caprification Cause Late Figs to Set in Greater Numbers than Usual?*—The advocates of caprification affirm that in certain varieties it causes all, or the greater number of fruits, to remain on the tree, which otherwise would have fallen off. To verify this assertion I have many times made the common experiment which would occur naturally to any one, that of comparing fig trees of the same variety to some only of which the caprifig had been brought, in order to observe the difference. Those I have observed with that view are the Lardaro, the Sarnese, the Colombro, and the Sampiero. With regard to the first two, the experiments were made in different localities, especially on the Sarnese, which is very common. None of them showed the slightest effect of the action of the fly, in regard to the quantity of the fruit; and if ever any differences were exhibited between the caprifig trees and those not acted on by the caprifig, either in favor of or against caprification, they could always, on being well considered, be clearly traceable to other causes (not to speak of soil, climate, vicissitudes of seasons, etc.), as for example, to the age or vigor of the subject, the number of branches, the having been or not enfeebled by a previous superabundant crop, etc. And what I say of the Sarnese may in like manner be said of the Lardaro, with this exception, that being cultivated almost exclusively in the immediate vicinity of the Capital, I had no opportunity of observing it in distant localities. Cultivators affirm that this variety more than any other stands in need of caprification, and indeed it loses generally nearly the half of its fruits. But of this variety I will only state two things, not to fall into lengthy repetitions: First, that the caprifig trees lose also a great quantity of their figs; and next, that those not caprifig ripen many of theirs, with such differences as are occasioned by the above-mentioned causes or others to which I shall presently advert.

The double-bearing figs, such as the Paradise, the Colombro, and the Sampiero, usually bring many of their early figs to maturity, and but few or none of the late ones; and cultivators affirm that by caprification an abundant second crop may be obtained. Although I had often seen the Colombro ripen many of the late crop without the caprifig, I nevertheless wished to see the results of comparative experiment. Therefore, in the beginning of July, in the neighborhood of Pianura, I gave the caprifig to several trees of the Colombro fig; amongst them many had lost all their figs by the middle of August, some retained a few; they had fared like other trees of the same sort not caprifig and placed at a considerable distance. Among the fallen fruits some contained the insect, others did not, and it was the same with those that remained on the trees and were advancing toward maturity. Amongst these Colombro figs were several trees of the Sampiero, of which four were caprifig. The result was that two of them lost all their figs, both those at the base of the fruit-branches, called *pedagnuoli*, and those of the extremities, called *cimaruoli*. The other two trees scarcely ripened a fourth part, and those chiefly *cimaruoli*, and the fly had penetrated into some of the fallen fruits. It must be noted, moreover, that the above fig trees were all of the same age, in the same soil, with the same exposure, and all more or less had brought to maturity a good, early crop. The same experiment, repeated at Ischia on two trees of the Colombro, produced no result. For if these trees were pretty well loaded, the same thing took place in many other parts of the island without caprification, and

not infrequently in the same places were fig trees near to each other, some with and some without fruits, without anything appearing to show a probable reason for such diversity.

8. *Does the Caprifig, by the Assistance of its Insect, Fecundate the Female Flowers of the Late Figs?*—As soon as botanists learned, from the observations of Pontedera, that the flowers of the different varieties of the domestic fig were always all female, as well in the early as in the late flowers, and as they believed that the caprifig was the male plant, they at once, by common consent, without further observation, concluded that these female flowers could only be fecundated by means of the insect—recognizing in this a providence of nature for the accomplishment of that important function. And I, myself, having ascertained the correctness of the fact stated, came naturally to the same conclusion, although I had ascertained that the caprifig was not the male of the fig, but a very different plant. But in the course of time doubts gradually suggested themselves to my mind, to remove which I devoted myself to ulterior researches. First, it appeared to me impossible that in all sorts of early figs there should never be a single fertile seed, even when male flowers were present. Yet, after repeated examinations, I always found such to be the case. This must not excite surprise, however, on considering that the flies which enter these come from the *cratiri* (the young figs of the caprifig that were first formed in the previous autumn), in which are either no male flowers or very few, and those almost always imperfect, and with little or no pollen. And then, if in these early figs I occasionally found a male flower, it was only formed long after the female flowers, and its anthers never opened, so that any one might conclude that if there were no fertile seeds it was for want of fecundation. What is surprising, is the fact that in the late figs the embryo is produced especially in the *pedagnuoli* (at the base of its branches), and in hot situations, whether the tree be caprifigged or not. The White fig, the Dottato, and others which the Neapolitans do not caprify, produce abundance of fertile seeds, even in places where caprification is never practiced, and where the caprifig itself is rare, as, for example, at Camaldoli, Ischia, etc. But such observations always leave some doubt whether the insect may not have come from somewhere else, and effected fecundation. In reply to which it must be remembered, in the first place, that this insect, when he issues from his nest, flies with difficulty to any considerable distance; and next, that after he has entered the fig he dies there, and is afterwards to be found either entire or partly decomposed; at the least there remains, as a sign of his having been inside, a brown spot, which easily turns to decay.

Now, in places where there are no caprifigs, and where caprification is not practiced, I have found the seeds perfect in figs which did not show the least sign of the insect having penetrated. Besides, towards the middle of July I impregnated artificially thirty flower-heads on a Lardaro fig, by introducing into the aperture the pollen of the caprifig; one month after ten of them had fallen from the tree without their seeds being fertilized, and the remaining ones did not differ, either in size or in the number of fertile seeds they contained, from the numerous others of the same tree which had neither been caprifigged nor artificially impregnated. Not satisfied by all this, I made three consecutive years an experiment which appears to me more important than all the above-mentioned observations. Before any flies began to issue from the

caprifig flower-heads, I closed the apertures of some still small figs of the Lardaro and Sarnese varieties with gum arabic mixed with chalk, so as to prevent the insect, should he attempt it, from penetrating withinside; and I took care to add some of the mixture as the figs grew, to keep them well closed. When they attained their full size I opened them; they showed no sign whatever of the fly having penetrated, yet they contained seeds with perfect, well-formed embryo. If this experiment is made upon trees to which the caprifig is afterwards applied, it is a curious thing to see the fly, after issuing from its nest, seek a place to deposit its eggs, and, lighting upon the closed fig, exert itself with all its might to penetrate all around the mouth, trying to force it open where it was only slightly green, and finally, seeing all its endeavors hopeless, turn away from it. This experiment clearly proved that caprifigation was not necessary to generate the embryo of the fig, though it was not conclusive as to impregnation not being requisite. For it might have happened that some organ or other under some strange form might contain the pollen, and be found on or amongst the female flowers.

With this view I examined with the microscope, with all the care in my power, all the internal parts of the fig in every stage, from its first appearance to the attaining its full size—the scales under the mouth, the pedicels, the bracts, the perigone, the pistil from the base to the summit—and I never succeeded in discovering anything which contained pollen, or any other analogous substance which might be even suspected of producing impregnation. Only it must be observed that on the style, from its young state till shortly after the changes that take place in the ovulum, or about that time, there appear certain obscure grains, which at first sight have some resemblance to those of pollen. On attentive examination they proved to be little glands with the appearance of wrinkled grains, composed of cellular tissue; and as they first appear so they remain. The same grains appear also in the caprifig and in exotic figs. Besides, it appears that the style has not the tissue for conducting the pollen, unless you would give that name to the internal part of the style, formed of longer and more slender cells than those of the exterior, as may be so frequently observed in lengthened slender organs of numerous dicotyledonous plants. Thus every attempt on my part to discover any need of the fecundating substance of stamens to produce the embryo had failed. And, if I am not mistaken, this is not an isolated fact in the science, Mr. J. Smith having (Transactions of the Linnæan Society, 1840) already announced that the female of a dioecious plant, indigenous to New Holland, of the family of *Euphorbiaceæ*, called by him *Coelebogyne*, bears in London* fertile seeds without a male flower having been discovered on it, and without any suspicion that it could have been impregnated by the pollen of any allied plant; and whoever, in answer to what I have stated of the fig, should allege the assertion of Linnæus, that this tree only produces good fruit where the caprifig grows, must recollect what I have said respecting it—that differences in climate and season more or less hot cause more or less of the seeds to remain empty, and that on that account, in the northern parts of Europe and in stoves, the seeds would probably always remain sterile.

* At Kew Gardens.

So it is with our Vernino fig, as to the fruits which it ripens in the open air in November and December, and with that treble-bearing La Cava fig, which will sometimes ripen in a room in the depth of winter. On the other hand, the appearance of the summer figs at a time when the flower-heads of the caprifig are in a state of perfection, the insect ready to come out, shows in a manner a *final cause*, which can hardly be anything but fecundation. This consideration has always deterred me from publishing the results of the above-mentioned experiments, and has been the cause of my repeating them so often. What may be really the design of nature in this combination I confess I am ignorant of. Nor do I pretend, with the single example of the fig, to disprove so universal a fact as is the necessity of the concurrence of pollen and impregnation for the generating of the seminal embryo, proved by innumerable experiments made by so many distinguished men for a century back. I only state what I have seen in this plant, it being possible that others with a more acute judgment than my own may loosen the knot and discover one of the numerous contrivances by which nature meets so frequently her wants, when for the fulfilling of some particular end she adopts secret and complicated modes, with strange and unusual disguises.

9. *Does the Fly Cause the Setting and afterwards the Early Maturity of the Fig by the Puncture it makes in it?*—The ancients believed that the quantity of humor in the fig might be the cause of the late ripening of its fruits, or by suffocating them that of their falling off when still sour, and that whatever diminished the quantity of humor, if it did not cause them to set, at least would aid in that operation. And the celebrated Tournefort was of opinion that the insect produced that effect by piercing or gnawing the mouth, or the inside of the fig, so as to draw out the superabundant fluids. This opinion has been followed by many among the moderns, it appearing to them that the case of the fig should be in every respect compared with what occurs often in pear, apple, and other fruit trees, in which it is manifest that the blighted fruits ripen some days before the others; and Bernard, of Marseilles, a distinguished agriculturist, as I read in Gallesio, is of the same opinion, it appearing to him that what happens from the fly can be proved artificially by pricking the unripe figs with an awl, or even with a straw, and putting a little oil on the puncture. But I think that such ideas and reasonings, founded on analogy, are worth nothing in the present case, for before coming to the explanation, they ought first to have ascertained whether in fact the fly does or does not hasten the maturity of the fruit, and we have already seen that it does not. Besides, it is not proved yet that the insect pierces the mouth of the fig at all, nor any other part, excepting, perhaps, the ovary in order to deposit its eggs in it; on the contrary, I believe that it never does; for looking with attention, I have observed it make its way from scale to scale, sometimes unable to overcome the resistance they oppose, nor ever breaking through any of them to clear its way; and these scales, examined under the microscope, showed no injury from the passage of the insect. But supposing the fly to have pierced or otherwise injured some scale or other, it does not follow thence that the fig must ripen earlier, when we often see it injured or gnawed away in some places—ants often enlarge the mouth and carry away the scales—and yet these injured fruits either never ripen earlier, or very rarely so, and that from other causes. That puncture and oil hasten the

maturity is proved by experiment, but this puncture operates in a different manner, in my opinion, from that which insects make into the ovaries of pears and apples to deposit their eggs. For amongst the pears and apples containing insects' eggs, some, whilst they are growing and still acid, become diseased and fall; others, continuing to grow like those that are not touched, become soft when the grub issues from the egg and commences feeding on the pulp; and this pulp is then sometimes, but not always as some believe, of a good flavor. But the fig in the above-mentioned experiment does not ripen from the puncture, but from the oil, as the same effect is produced by putting a little on the mouth of the fig. How it produces that effect on the fig is unknown to me; being put on the mouth it contracts it, then gradually the oil spreads, and wherever it reaches the dark green color of the epidermis changes to a bright green. I thought that I perceived that it did not affect the milky juice in the least, but rather impeded evaporation or other functions of the epidermis, as well in respect of light as of air, and that on that account the anointed fig commenced ripening from the base, and was inferior in flavor to those ripened naturally. But to return to the case of the fly: it neither pierces nor gnaws the substance of the fig, and if it inserts its eggs into the ovary, which I can neither affirm nor deny, it is certain that nothing is hatched from them; but I am inclined to think that it does not even pierce the ovary, as it does not prevent the formation of the embryo, and the difference between the fig and the caprifig is very great.

10. *Action of Fruits which are Ripe and in a State of Decomposition upon those which are Younger and Sour.*—In making my experiments on caprification, as I was at a loss to conceive in what manner, visible or concealed, the fly operated, it occurred to me that possibly the caprifig flower-heads suspended to the fig tree and rotting there might possibly, by their close proximity to the sound figs, excite in them some similar alteration, which might bring on a premature softening. This suspicion arose from observing in stores of apples and pears that any rotten ones amongst them readily communicated their decay to the sound. In applying this to our case I did not intend to put forth any theory on the subject, as the science has not as yet any means of determining what it is that brings on the decay of any particular fruit, nor its effect on others around it; but what cannot be known by direct experiment may frequently be admitted or presumed by analogy and comparison; and as to the present question, as we have proved that the caprifig does not hasten the maturity of figs, it follows that such a discussion is idle. Nevertheless it may not be wholly useless, I think, to take the opportunity of relating an experiment I made for the purpose of ascertaining what I have alluded to.

Oranges, when they decay, produce mold and emit an offensive smell. On that account, and by reason of their temperature being probably affected during the change, I suspected that decayed oranges might, on the tree, cause the healthy ones around them to rot; I therefore gathered several oranges with their stalks and laid them by, and as some began to rot I hung them by a bit of twine close to others which were perfectly sound. The experiment lasted about a fortnight, by which time the moldy oranges had dried up, but none of the others, not even a single one, caught the disease, and all remained sound a long time after. It then occurred to me that if the mold touched the skin of the healthy orange it might produce the decay; I therefore scattered the

dust (or otherwise, the seeds or spores) of the mold in great quantities on some oranges, and on others I introduced it underneath the skin, as a contagious disorder is inoculated. But nothing of what might have been predicted happened; the wound, instead of festering, dried up, and in one orange, which after some time began to decay, the rot appeared on the opposite side to that of the wound. From this experiment, I should say that if oranges when moldy and exhaling an offensive smell do not communicate the disease to healthy ones on the tree, and if the mold only propagates on oranges already decaying, is it credible that ripe figs of the caprifig, beginning to decompose, should produce such an effect on the young domestic fig?

11. *Examination of Fallen Figs.*—If the insect has penetrated into the fig it can be known at once by opening it, and sometimes even that is not necessary when the insect is entangled and suffocated amongst the first scales of the mouth, leaving outside its wings and the posterior parts of its body. If, however, it reaches the inside of the fig below the scales, it does not easily decay, but remains nearly entire till the fig begins to show signs of maturity; then it becomes buried in the swelling and softening florets, and soon decays. But whenever the insect dies immediately the surrounding parts turn brown, and subsequently blacken and rot, even the scales of the mouth, which are harder than the other parts, but especially the stigmata and styles in the cavity, as they project beyond the perigone and bracts, and not infrequently also the ovary and part of the receptacle. This rarely happens where the insect does not penetrate, and if the style discolours or dries up, it never becomes black or rots. At any rate, experience is a better guide than words, and a single glance of a practiced eye will tell with certainty whether the fly has been in the fig or not. Now, every variety of fig sheds a certain number of its fruits, some more, some less; and in the opinion of cultivators, the Lardaro, the Chiaja, and the Sarnese would lose all or most of theirs but for caprification. If such were the case, one would naturally conclude that what fruits should fall after caprification would be precisely those in which the fly had not entered. With this view I, one year, set to examining all the figs that had fallen from the Lardaro, the Chiaja, and the Sarnese, all caprified. On July 29th (the fall of the fig commences towards the end of this month and the beginning of the next) I collected under the Sarnese sixty-seven fruits, of which thirty-five had the insect; three days after thirty-one, of which twenty-four had the insect; the remainder were black inside, but without any fly—perhaps it had got out again. Afterwards I found one hundred and twenty-two fruits with the insect, one hundred and forty-one without. They were of different sizes, *pedagnuoli* which had first appeared in June, and *cimaruoli* of July.

This experiment does not prove, indeed, whether caprification had been of use or not, except that if it had worked as the cultivators believed, we ought at least to have found the largest proportion without the insect, when, on the contrary, those with the insect equaled the others, or surpassed them in number, admitting that the fly had left many. Where I made this experiment I left at a certain distance another Sarnese tree without the caprifig, under which I at several times collected two hundred and forty fruits, amongst which thirty contained the insect, which had come from other trees, although at a distance. I wished to compare the number of fallen fruits of the two trees, but I found it

almost impossible to ascertain how many fell and how many remained; and where this could be done the conclusions were fallacious, as it was difficult to find two trees of precisely the same vigor and temperament. Near the one of which I speak was a variety of the other, produced from a seed which had sown itself in the fissure of an old wall, with the fruit rather larger, the peduncle rather longer, the pulp rather finer and whiter.

On July 24th I found fourteen fruits of the Lardaro with the insect, and twenty-seven without; on the 30th, under several caprifig Lardaro trees, I collected one hundred and sixty-eight *pedagnuoli* (about an inch long), and a great number of *cimaruoli*. Of the first, sixty-six, with the styles decayed and blackened, contained the insect; twenty-nine had them similarly decayed, but the insect had probably escaped, and seventy-three without the fly had not altered inside. Amongst the *cimaruoli* some had the insect, some not. On August 2d, fifty-five *pedagnuoli* with the fly, twenty-five without, and a great many *cimaruoli*, as before. On August 9th, forty-eight with the insect, fifty-six without; on the 17th, about two hundred with the insect, and as many without. Thus, out of seven hundred and ninety-three fallen figs of the Lardaro, a little more than half (four hundred and twelve) contained the insect; the others (three hundred and eighty-one) did not, and showed no sign of decay or other change.

Of the Chiaja fig I counted of fallen fruits, *pedagnuoli* and *cimaruoli*:

Containing the fly—

July 24th	136
July 27th	172
July 29th	164
August 3d	478

Total	946
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Without the fly—

July 24th	46
July 27th	20
July 29th	47
August 3d	127

Total	240
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In this case there appears a great surplus among the fallen fruits of those into which the insect had penetrated, so that its effect appears rather to have been prejudicial. The trees had been abundantly caprifigged, and in every fruit there were generally more than one insect in the cavity or amongst the scales; but more frequently amongst these, and around the insects, there were evident signs of corruption. The fruits without insects generally showed no alteration, excepting that in some the greater part or all the styles were faded, dried up, or slightly discolored. But the results of the above-mentioned enumeration must not be considered as invariable, for the same fig tree bears very differently in different years, according to the season, as well as to the quantity it bore the preceding year; and, besides, the finding more or less of the fruits with insects depends on the greater or less quantity of caprifigged fruits suspended, and the period when that was done, as there are some cultivators who caprify three times, and then the insect is found as well in the *pedagnuoli* as in the *cimaruoli*. Last year, having returned to the same fig trees, and again examining their fallen fruits, I found the proportions a little different from those I had ascertained the previous year. In the Sarnese fig the fallen fruits without insects surpassed the

others by about a third; in the Chiaja and the White fig the numbers with and without the insect were about equal, and in the Lardaro the proportions were much the same as in the preceding year.

Although I examined an infinity of ovaries in the fallen caprifig fruits, I never could discover with the microscope the least sign of their having been pierced by the insect to introduce its eggs, and never found anything within resembling a grub; thence it is probable that the insect does not pierce them. I say this in order to call attention to the circumstance that the blackening and decay around the ovary is not to be attributed to the puncture, which we do not know to take place, but to the body of the insect itself, which produces the effect either by some unknown action, or by some acrid humor it contains. Thus, from the above observations, it may be concluded that the fly of the caprifig is rather injurious, and that far from making the fruits remain on the tree, it either causes or facilitates their fall, especially when it has penetrated into the inside and produces decay, where it dies. But this I think will happen rather to the deciduous than to the permanent fruits, because the first, even though they be *pedagnuoli*, are by their nature disposed to fall, hold but slightly to the branch, have but little firmness in their pulp, the florets but little grown, and the inner cavity large. If with this bad conformation, either natural or superinduced pending the growth, the fly comes to inflict further damage, every one must see that the fruit cannot on that account remain longer on the tree than it would otherwise.

Amongst a great number of fallen fruits, some, whether with or without the insect, showed a few florets which had grown more than the others, and had had time to form their embryo.

12. *Examination of Permanent Figs.*—The examination of the fallen figs was naturally followed by that of those which remain on the tree to ripen, in order to ascertain whether they contained the insect, and whether it induced decay. But in this research a source of error might lie in the mistaking for permanent fruits those which might still fall before they ripen; these, however, although they may appear to hold firmly onto the bough, may be known practically by a peculiar look, by being usually badly formed, imperfectly nourished, of a paler green than the rest, and emitting when pierced a small quantity only of a thinner milky juice than the sound ones.

On August 1st I cut from a caprifig Sarnese fig a branch bearing eight fruits; one ready to fall contained the insect; so did three others of a doubtful kind, that is to say, not showing clearly whether they would come to maturity or fall prematurely, they showed the usual blackening, although slight, of the ovary. The remaining four, intermingled with the others, were strongly attached to the bough, had no fly withinside, and showed no sign of alteration. Two days later I cut from the same tree another branch with sixteen fruits, of which one with the blackened styles from the presence of the fly was in the act of falling; two of middling size and firmly attached contained the insect, not in the cavity, but amongst the scales of the mouth, and were little if at all affected; a fourth, the youngest of all, although it contained the insect, appeared to be set, and was not injured. The remaining twelve, all *pedagnuoli* of middling size, were sound and secure, had neither fly nor any sign of decay. On August 5th I cut a third branch with eleven fruits all set; four contained the insect, the other seven did not. In

the district of Portici a branch of the same variety of fig with nine fruits had the insect in two fruits ready to fall and in three permanent ones. At the same time on a Sarnese fig I found, besides a number of fruits ready to fall, with the fly, thirty-seven permanent and large fruits, of which ten had the fly. From a Chiaja fig copiously caprifigged I detached in the beginning of August forty-three well set figs, of which only thirteen were without the insect, which in the others was either among the scales of the mouth or in the cavity, or in both; but always when among the scales it does little damage. And the following year, among eighty fruits of the same tree thirty-nine only had the fly, which I also found in seventy-four out of one hundred and ninety-four fruits of the White fig. In the first days of July I suspended some caprifig flower-heads to a small tree of the Lardaro which had one hundred and seventy fruits; in the course of the month forty-three had fallen; I gathered on August 14th the remaining one hundred and twenty-seven, which had become consolidated. Having opened them, I found them sound, with good seeds; about thirty only contained the fly, which had done little if any injury to the florets.

The facts noted of the Sarnese and Lardaro figs prove clearly that it is not by the effect of the insect that the fruits remain on the tree, as the greater number of those which were the soundest and most vigorous did not contain it. The experiment made the first year on the Chiaja fig might perhaps tend to show the contrary, were it not that there was so far a greater proportion of the fallen fruits into which the fly had penetrated. That arose from the great quantity of the caprifig, which had been applied three times, so that few of the fruits, whether deciduous or permanent, could escape the insect. Therefore, from the observations stated under this and the preceding heads, it follows that the insect is not the cause of the permanence and setting of the late figs. If it had been so, it would have been found only, or at least chiefly, in the permanent fruits, whereas the contrary was always observed; and I am of the opinion that a fig tree, whether caprifigged or not, always loses the number of fruits it is destined to lose, from whatever cause—either its own temperament or external causes—and that the deciduous ones fall the more readily from the flies having penetrated into the cavity and induced decay and mold; and it may happen even that on this account many a fruit falls which might otherwise have consolidated itself and ripened. As to the permanent fruits which had the fly, I think that from their size, strength, and vigor they had been enabled to resist the effects of it, especially where it remained caught among the scales of the mouth; but as soon as they commence ripening they rot very easily, the flavor becoming affected.

But as in all our researches and experiments we have been unable to discover any reason in the world why the caprifig fly should render the deciduous fruits of the domestic fig permanent, or hasten their maturity, and as it cannot be denied that some varieties lose every year a great many, others very few, and that some ripen earlier, it would be desirable to know how this happens; and this question I will now shortly discuss.

13. *For what Reason does the July Fig Commence Ripening Some Days Earlier than the Others?*—Of this fact I see chiefly three causes: First, the tree shoots out some days sooner than other varieties; secondly, it puts out but few or only very small early figs, which fall off very

soon; thirdly, the young branches do not lengthen much and grow pretty equally, throwing out scarcely any coarse, watery shoots. It follows naturally that vegetation commencing early, the flowers are also formed early, and the nutritive juices not being taken for the spring figs, nor drawn away to the extremities of the branches, are directed in greater abundance to the summer figs. What is there then surprising in their ripening a few days earlier than other varieties? The contrary effect is observed in the absence of any one of the above circumstances. The winter fig produces few small and deciduous early flowers (the growth of the branch is rather weak than otherwise), yet vegetation being about a fortnight later than in the Dottato and other figs, that is enough to occasion its fruit to ripen late. The Colombro, worn out by the quantity of early figs which attain maturity, produces late in the season only a few late ones, and those usually fall off unripe, either all or the greater part of them; indeed, that the vigorous growth of new branches retards the ripening of fruit can be proved by this, that if their ends are pinched off, the ripening will take place much earlier.

14. *For what Reasons do the White and Dottato Figs Carry their Fruits Better than the Others?*—On this occasion an important question ought, if possible, to be decided, that is, whether these figs are true species distinct from each other and from all others, or whether all the domestic figs are but varieties of one species. If we could decide for the first alternative, there would be no need of further argument, as it is natural that different species distinguished by external characters should also have different constitutions. But I will admit, although I am not convinced, that all our figs are varieties of one species. The varieties raised from seed are numerous, and in some plants infinite in some respects; but that which has now to be noticed as more especially relevant to the present question is, that sometimes the constitution is altered, so that some varieties arise which feel certain influences more or less than the natural or primitive type from whence they proceed, for in a wood of chestnuts or oaks we often see variations from one individual to another. By this I mean to say that the White and the Dottato figs, whether you consider them as species or as mere varieties, cannot be denied to have been endowed by nature with a power of carrying nearly all their fruits. But difference in habit, however slight, is usually indicated by external characters or signs; and these, caused themselves by the diversity of habit, are again the causes of other differences. So the White and the Dottato figs are the strongest and most vigorous of all those to be found in the neighborhood of Naples, and thrive in any soil. Their leaves are large, not much divided, coarse, especially those of the Dottato, and support well the vicissitudes of the seasons; and the leaf is the mother and nurse of the fruit. Vegetation in these varieties usually proceeds regularly, as they shoot in March. They set no early flowers, and the shoots are not slender, unequal, nor attenuated, but thicken and lengthen moderately; the fruits grow regularly from the base upwards, and in the order of their age; they are, moreover, of a fair size, well proportioned, and, though not few in numbers, are not crowded so as to interfere with each other's nutriment. All these circumstances together produce, according to my opinion, the above effect; and the proof is clear on seeing what are the effects produced when, from the vicissitudes of the season or other causes, the leaves suffer; or when, the sap being irregularly distributed, the branches lengthen moderately, and produce a great deal of wood. Then

the trees lose many fruits, but always less than other varieties, being supported by their intrinsic qualities.

15. *For what Reason does the Lardaro Fig Lose the Greater Part of its Fruits?*—The circumstances stated under the last two heads explain readily the cause of the Lardaro. This variety, though coarse in appearance, suffers by nature much from changes in temperature and from moisture in the atmosphere; and if the moisture is combined with heat, it causes it to throw out a great deal of wood. It produces a good many early figs, which I have never seen ripen, although they often attain a considerable size. The leaves are deeply divided, the vegetation of the branches unequal, and without order—here and there coarse shoots, which grow in a short time to a considerable length, with twenty or thirty eyes; and whilst in other figs at the end of August the shoots often cease to grow, or lose much of their vigor, those of the Lardaro continue to lengthen through September, and not infrequently through a good part of October, having always figs in the axils of the leaves. These fruits are very numerous, and many of them ill-shapen, distorted, lumpy, and of irregular growth, often two of different ages in each axil. In such a disorderly activity of vegetation, with such a number of fruits of different sizes and forms, with so much sensibility to atmospheric influences, it is not a matter of surprise that this fig should promise much and perform little, when we see that one only of the above-mentioned causes will produce the effect; for we have stated already that the Sarnese and Chiaja figs lose a part of their fruits from producing too many. Meanwhile, I have not been able to correct the defect of the Lardaro by pruning, nor by leaving uncultivated the ground where it is growing; for that has appeared always to give it new strength to replace its pruned top, and throw out coarse shoots and make wood. Age, alone, and the enfeeblement of decay tames it, and then its branches, growing little and becoming less disorderly, preserve their fruits better. The difference may be observed, also, among the branches of one tree; and this to such a degree that whoever makes comparative observations on different individuals of this variety, sees that by diversity of age, soil, exposition, disturbed vegetation, or seasons, they vary so much that he cannot easily follow the thread of explanation. But, essentially, the facts are the same as those observed in other trees—that is, that vigorously growing individuals produce little fruit, and, like coarse branches, only make wood; that those which produce an inordinate quantity lose a good portion, and that generally a scanty crop follows an abundant crop.

16. *Effects of Grafting.*—After so many experiments had proved the nullity of any supposed effects of the fly on the domestic fig in making it retain its fruits, I one day, in the village of Ischia, came upon a Colombro fig, which seemed to show the advantage of caprification in a way to turn one's brain. It was in the center of an airy, open garden, with a good soil, situated in a flat, and far from the sea, a large and beautiful Colombro fig, with a handsome, well-formed head, the bark uninjured, the wood everywhere sound, and of a vigor and health without equal. From its foot arose a fine, large caprifig, its boughs intermingling with those of the Colombro. This tree, which had ripened its early figs, had, towards the middle of August, an abundance of the late crop, almost all with the fly withinside, firmly attached, and many approaching towards maturity. At some distance were other trees of

the same fig, some with few, some with many of the late fruits, but none which approached in beauty to the other.

The circumstance of its having ripened two good crops, which, in the Colombro, so rarely happens, induced me to try and ascertain the cause. In the first place, I thought of the strength and vigor of the tree, the moderate and regular growth of its branches, the fact of its being at such a distance from the sea as not to be affected by its breezes, and the fertility of the soil, all of which together might account for the abundance of fruit. But, after some consideration, I did not feel satisfied, and had the tree cleared at its base to ascertain whether these two trees of different natures might not be naturally united, or, as cultivators term it, grafted by approximation. I found that such was the case; and further, that the two were both united in the same manner just below the surface of the soil with a Dottato fig, a few of whose suckers grew up at a little distance.

Here were two subjects of consideration suggested: first, whether, among the various effects of the stock upon the graft in influencing the abundance of size of the fruits, a similar effect might be produced by the above-mentioned intergrafting of three different things. The second point appeared to me of more importance. The vegetation of the domestic fig, by the effect of atmospheric vicissitudes, never flags nor rests, at least sensibly, from spring to autumn, whether with the growth of the branches or of the fruits; but that of the caprifig rests a little after having produced the first crop, so that when these are ripening in June or July, the young ones of the next crop are not yet appearing on the new branches, whilst those of the domestic fig are a month old, and in full growth. Such being the case, where the stems of a Colombro and a caprifig are united, and both together grafted on a Dottato, it must be admitted, in the first place, that the roots are sufficient for all three; and, as between two trees joined at the base, the sap must pass more or less readily from the one to the other, and as the periods of vegetation of the two do not precisely agree in the present case, who would not see that the Colombro fig, forming its second crop whilst the caprifig is at rest, must receive the greater part of that which is absorbed by so many roots, and perhaps even a little of the sap of the caprifig itself? But leaving conjectures, which, indeed, are neither strange nor new, on the effects of grafting, let us return to facts easily appreciated by the senses. If the Colombro fig above mentioned bore so large a crop of fruits, not by the effect of the graft, but merely by having its boughs intermingled with those of the caprifig, the same effect ought to be produced where they are so placed without being united. And so I have seen it at Baja, but without the Colombro having, on that account, any more fruits than others far from the caprifig.

And I may now declare, that after many years' researches, and following up all the accounts and stories of cultivators, it has never happened to me to hear of any fact, however strange, new, or singular, on this subject, that might not be accounted for otherwise than by the effects of the insect.

17. *What Account should be Taken of the Maxims and Experience of Cultivators on Caprification?*—From all that is stated under the preceding heads, I should place no certain reliance on comparative observations made by the lower orders on two trees, one caprifig and the other not, to observe the differences. For as differences in humidity,

heat, rain, atmospheric influences, soil, etc., often occur, that which you may have thought you have ascertained one year will turn out quite different another. Above all, a frequent cause of error with us is, that two trees, believed to be individuals of one variety, are, in fact, two distinct varieties raised from seed, but so near to each other that cultivators do not perceive the differences. Varieties from seed have no limits in certain plants, and are produced in such numbers that often they may not be distinguished at first sight by external signs, and often these differences are only in the constitution, as, for example, in the horse-chestnut, the seeds of which, taken from one tree, will produce a hundred individuals, which may be all alike in all their parts, raised on the same soil, with the same exposure, and yet many of them differing from the others in the number of fruits they bear in proportion to their vigor, in their size, in the periods of their budding and flowering; and that happens often to certain figs which spring up everywhere about us from seed. Thus, in the commencement of my researches, I was often deceived, believing two trees to belong to one variety, when, after a time, I ascertained that they were distinct varieties; and this happens more frequently to those races to which the caprifig is given, that is to say, to the Lardaro, the Chiaja, and the Sarnese, which partake much of the wild nature, and for that reason bear so much fruit.

I have often discussed the subject with cultivators well informed, but preoccupied with the idea of caprification. To every contradiction of mine they put forward that the experience of many years had proved to them the importance of it. Sometimes we came to the proof. When I showed them fruits not caprifiged ripening at the same time as others that were caprifiged, the most sensible of them replied that that depended on the soil, but that did not affect the property the insect has of making those fruits into which it penetrates set and ripen early. If, then, I showed them the number of fruits fallen from a caprifiged and non-caprifiged tree, they always claimed the advantage; and if I said that the same fig, as the Sarnese, for instance, ripened at Ischia abundantly without the caprifig, they said that depended on the soil and on habit. Our cultivators hold it for a maxim that if a fig has once had the caprifig applied, even the White fig, which in their opinion does not require it, it feels ever after the influence; and as if having once tasted of it gets a bad habit, will the following year only produce few fruits without the caprifig. Besides, seeing the insect with so much industry and ardor work its way from scale to scale into the inside of the fig cannot, in their opinion, but produce some effect. With such and similar matter it will be admitted that I may be quite satisfied.

18. *Conclusions.*—From the facts above stated it appears clearly:

1. That to understand well the effects of caprification, it is in the first instance necessary to know the nature of the fig and of the caprifig, and what connection they have with each other. And we have seen that the caprifig is not the male of the fig, as has been hitherto believed, but a species so different from it that it may well be taken as the type of a distinct genus.

2. The structure of domestic figs, as well of those to which the caprifig is applied as of others, is perfectly similar in as far as concerns the organs of the flower, the structure of the seed, and of the receptacle; so that it does not appear how the insect of the caprifig can be necessary to some varieties only.

3. And we have seen by experiment that the insect neither hastens the maturity nor causes the fruit to set, whether of early or late figs, nor yet is it necessary for fecundation.

4. That the circumstance of the caprifig losing early many of the fruits in which the fly has not been bred, does not serve to prove the necessity of caprification, but rather to refute the doctrine completely, as the fly does not breed in the domestic fig; and besides, we have seen that when the caprifig bears a large crop of fruits, many of them fall unripe, even though the insect has been in it, and the grub be found in the ovaries.

5. And in respect of the caducity of the fruits of some figs, the causes must be sought for chiefly in the constitution and mode of vegetation of those varieties; and also in the soil, climate, and vicissitudes of the season.

6. That thus caprification is useless for the setting and ripening of fruit, and therefore this custom, which entails expense and deteriorates the flavor of the fig, ought to be abolished from our agriculture.

19. *Conjectures on the Origin of Caprification.*—Having now reached the term of my labors, I cannot conceal a certain anxiety which has secretly grown up in my mind. I fancy I hear from all quarters that the custom of caprification being of such ancient date, and having been upheld by so many distinguished men of science, both ancient and modern, cannot but be founded on experience, against which no theories, no subtleties of science, are of any avail. Verily does the rise of such ideas in my breast so agitate me, that many times in the midst of my labors my breath has been stopped by the fear that some fact illy understood has drawn a veil over my mind. Nor should I ever have ventured to publish this treatise were it not that I thought some consideration was due to the labor I had bestowed on it. Where the love for a subject induces one to undertake a work, the work itself increases that love. Besides there is the hope that, if not the whole, some part of it, at least, may prove useful to science. Of this it behooves others than myself to judge.

But independently of all such considerations, I may, in courtesy, be allowed some conjectures on the origin of caprification, and how it has become spread among us. The time when it began is entirely unknown, for the first record of it is in Herodotus, who lays it down as a proof of the dependence of the female date on the male, as of the fig on the caprifig. Certainly experience proved to cultivators the case of the date tree. Experience, therefore, many would say, proved to the Greeks the necessity of the caprifig for the fig. But it is not everything which our ancestors have handed down to us, by history or by popular tradition, that has been proved by experience, and often has analogy been confounded with experience. Let us suppose that the case of the date tree was first known, and that some one observing the caprifig, with its coarse, wild aspect, and with its fruits not good to eat containing the fly withinside, should have conceived the idea that it was necessary for fertilizing the fig; this would not have been a demonstration, indeed, but a plausible supposition. And how many theories are there not built upon a few facts generalized by conjecture, analogies, and possibilities? These theories, in course of time, are proved or refuted, and often last a long time in spite of refutation, so difficult is it to turn the mind away from strong impressions and preoccupations, and to turn it away from

habit; and habit is of such force that it becomes a second nature, as the old and popular saying has it. And when a maxim is once taught to the lower orders, especially to those living in the country, who are more tenacious of their habits and customs, every one knows how difficult it is to get the better of it, especially when it is connected with the hope or possibility of gain, and is ancient. Now, who can say that the custom of caprification did not rise and spread amongst cultivators in some such way? And habit is so great in this class of persons, that often they will not see their own loss and the gain of others, preferring to die in their errors rather than better themselves by the example of others.

Certain facts, either at first inexplicable or marvelous in appearance, have often given rise to popular opinion, which, from the remotest antiquity, have come down to us from generation to generation. Certainly, from the sight of the moon springs up at once the desire to know its properties; and at its brilliant and even marvelous aspect every one is naturally disposed to grant to it a large influence over the things of this world; and cultivators of old consult its phases for the periods of confiding seeds to the earth, or felling trees; from that body, in short, they deduce either the probability or the certainty of good or evil. I myself have no experience on the influence of the moon; but I believe that among popular credences, supposing them not to be all erroneous, none are more so than this on seed sowing. In vain, however, would it be to tell the cultivators of their error; all with one voice cry you down with *experience*, and you must be silent. Experience being the sensible ground for reasoning on phenomena, there is no appeal against it; and however great and numerous the proofs you have to the contrary, the general opinion, resolutely maintained, at length puts you to silence. But the case of the moon, you say, has nothing to do with caprification. But do you believe, that on seeing for the first time the different kinds of receptacles of the caprifig, the insect propagated within them, this same insect afterwards issuing forth and penetrating into the domestic fig, forcing its way from scale to scale of the mouth, in a manner which one would have been at a loss to imagine—do you believe, I repeat, that this fact would not suggest to your mind some great design of nature to be fulfilled? And this was observed by the ancient Greeks, a people of lively imagination, who in all natural phenomena, in many plants and flowers, saw secrets, and wonders, and records, and living signs of human affairs.

It is certain that the practice of caprification came to us from Greece, if we give faith to Pliny, who says that in his time it was in use in the islands of the Archipelago, and entirely unknown to the Italians; but at what precise time it was imported I am unable to say. Writers on rustic affairs in the thirteenth century speak of it as a thing practiced in some places, and they then knew not how it came amongst us. What appears to me to be interesting is, that it was adopted by us precisely as the ancients had it—the opinions of our cultivators being the same as those of the Greeks as to its utility. Among country people the most remote traditions are perpetuated without any alteration of consequence. We read, for instance, in Dioscorides, that the mandrake has secret virtues, and that it is used by witches. Now, in some parts of our country, where the plant is common, the same opinions are held of it. As I was wandering one day about some fig grounds near Naples, I observed suspended to some fig trees some of those spongy excrescences

found on elm trees, and occasioned by some aphid or pulex for the purpose of propagating within it. Having asked what was the use of it, I was answered by the cultivator that those spongy excrescences were as good as the caprifig to make figs set in abundance, and that he had been taught the recipe by his father, who had proved it, and his own experience had confirmed the advantage of it. This is, without doubt, an absurdity, yet the same thing may be read in Theophrastus; and afterwards Palladio, in his chapter on the fig, says: "And if there is none of this" (*i. e.*, of the caprifig), "a branch of wormwood may be suspended, or the excrescences which are found among the foliage of the elm." Such is one of the numerous examples of ridiculous and strange practices in use among the lower orders from the remotest periods; however contrary to reason they remain in vogue, and those who believe in them and practice them allege experience in justification. Certainly, as we have already said, experience is the groundwork of all sound reasoning or phenomena, and we ought on every occasion to follow it; but in speaking of experience, we must know by whom and in what times it was had.

Returning to caprification, from which we have somewhat diverged, neither its antiquity nor the experience of cultivators are of any account. I do not wish to disparage the labors of so many great men who have written upon it, but I only say they made no experiments; the ancients, like Aristotle and Theophrastus, relating what was the practice, and Cavolini and Galesio preoccupied with Linnæus' opinion.

TRANSACTIONS

OF THE

FOURTEENTH STATE FRUIT GROWERS' CONVENTION,

HELD AT

SANTA CRUZ, NOVEMBER, 1890.

TRANSACTIONS

OF THE

FOURTEENTH STATE FRUIT GROWERS' CONVENTION,

HELD UNDER THE AUSPICES OF THE
STATE BOARD OF HORTICULTURE, AT SANTA CRUZ,
NOVEMBER 18 TO 21, 1890.

CALLED TO ORDER.

The Convention was called to order by Hon. Ellwood Cooper, President of the State Board of Horticulture, promptly at 10 o'clock A. M., Tuesday, November 18, 1890.

PRAYER.

Rev. A. T. Perkins opened the Convention with prayer.

VICE-PRESIDENTS.

W. H. Aiken, of Wrights, and H. H. Clark, of Santa Cruz, were chosen Vice-Presidents.

THE HOSPITALITY OF THE CITY.

By Hon. G. Bowman, Mayor of Santa Cruz.

It is an easy matter for a committee to make a programme, but just why they should have me down to make remarks (not being a remarkable man) I can't understand. No one has ever heard me make a speech, let alone make remarks before as intelligent a body as is represented here to-day—a body of men who are solving the great problem of the future prosperity of our State. The collapse of the mining industries has given birth to this Convention. Our fair land of varied climate and soil, with its hills, mountains, and dales, needed but to be understood to make it the best country upon earth. I am satisfied the solution of our prosperity is in horticulture, and is in good hands.

Now about remarks: I suppose on account of being Mayor I am expected to know something about the commonwealth I represent. It is a theme fraught with interest. Nature has done more for this place, taking everything into consideration and the account of travelers, than any other place in America.

The mountains and ocean come together here, supplying us every day with pure sea and mountain air. Excessive heat and cold are never known. To the traveler nature tells her own story when he sees trees two or three hundred feet high, ten to twelve feet through, straight as

an arrow, vigorous, and luxuriant. We know that there are no prevailing winds, that soil and humidity are equally good. The undergrowth here is equal to that of the tropics. The summer prevailing winds are from the northwest. Our mountains protect us from those winds. In an area of about ten square miles we can grow almost anything that is grown in the world.

I believe it is the aim of all to locate in the eventide of life where they feel that they would like to stay while life lasts, and rest their bones when the struggle is over. I searched the western slope from British Columbia to Lower California for such a place, and found my ideal in the City of the Holy Cross. I sometimes think that the mantle of the prophets must have been on the shoulders of the Mission Fathers in selecting and naming this place, for we are gradually getting surrounded by locations of the most popular religious denominations.

Gentlemen, I am glad you selected the place for your Convention at Santa Cruz, and know our people will appreciate your coming. I extend to you, in their behalf, a most cordial and hearty welcome; also, with pleasure, grant you the entire freedom of our city.

ADDRESS OF WELCOME.

By MRS. W. H. AIKEN, of Wrights.

MR. PRESIDENT, LADIES AND GENTLEMEN: We welcome you to Santa Cruz. We, as a nation, have just passed through an exciting campaign, in which every loyal American citizen entered earnestly and heartily to express his opinion in the management of a government which has no equal among nations; an inheritance from our fathers, rich in possibilities, which we are in honor bound to pass on to our sons entire, with the added value which a generation of faithful service, under the fostering care of Providence, can achieve. I say we, for although one half our number have apparently little voice in the matter, yet when our more sturdy partners go forth to express their views, it is safe to say we, in our modest way, quietly echo, "Them's my sentiments."

We of California have had our hearts made glad by the prominence our State has attained for its wonderful productiveness; the eyes of the world are upon us, and their hands outstretched for a share in our product. We gladly respond to their call, not only for their benefit and pleasure, but for the gain that may accrue to us.

Alas for the farmer, the acknowledged lord of the soil, what with the horny-handed laborer at one end, the commission merchant at the other, and the gripman in the center, he is in danger of having the life squeezed out of him. We have a champion in our statesman who has the temerity to step in just here, and back this hitherto romantic lordship with something solid to stand upon.

Leland Stanford is prepared to place the modest merit of the farmer in the fore rank of service by the substantial aid which other great interests, merely financial, have so long enjoyed, to the end of making them feel theirs was alone the prerogative. Their unexampled prosperity proves the value it has been to them, and none should know better than those who have had aid from the Government what it is

worth, and who shall say the middle man is needed in this fundamental interest of all.

I have yet to hear a valid reason to negative this. True, the banks inveigh against it, which is a proof of its virtue, as the great howl of Europe is a proof of the fitness of the tariff law for America. I have talked with many upon this measure—to loan to farmers—and while the majority are timorous in expressing a favorable opinion, few are outspoken against it; one very worthy gentleman did say, “It would lead the farmer into all manner of extravagance—he would not rest until he had his fast horses and all sorts of fads.” If that is all, I should be very glad to see the farmer, who has heretofore borne the burden of life—I might say of the nation—have this burden so adjusted as to allow him to come up to the privilege of his brother banker and capitalist. I do not know that any here would object to this aspect of affairs.

Looking towards this result, there has been organized in the East a movement to which we should heartily respond, and combine our strength in an irresistible demand for a share in the results of our toil, which is the base of the prosperity of all.

He would be thought an unwise man who should erect a building without foundation, yet here we have the marvelous spectacle of a structure, the pride and boast of millions, with every one picking at the foundation. What we want is reciprocity.

I would suggest an acknowledgment of our distinguished Senator's efforts in our behalf during this sitting.

I am happy to welcome so important a body to our home, and will purposely refrain from any local allusions, since each one of us lives in the very best location and enjoys special advantages. I leave you to discover what ours are.

That your deliberations may be characterized by their accustomed spirit of harmony, striving for the best interests of all, we wish you during your stay, in true fraternal regard, to command us.

ANNUAL ADDRESS OF PRESIDENT ELLWOOD COOPER.

Vice-President AIKEN in the chair.

LADIES AND GENTLEMEN: This will be the fourteenth Fruit Growers' Convention, and the tenth held under the auspices of the State Board of Horticulture. In addressing you on this occasion, it would be appropriate to review what has been accomplished both at these ten Conventions and by the State Board, this year completing the first decade of its existence. I refer you to the Biennial Reports of 1885–86 and 1887–88; the Annual Report of 1889 and the Annual Report of 1890, which is now ready for distribution, and includes the transactions of the last Convention held in Los Angeles in the spring of this year. I cannot pass over this opportunity of complimenting our Secretary for his indefatigable efforts in having this work ready for distribution at this Convention. All those familiar with the workings of State institutions and the necessity of constant watchfulness and preparation in time, will comprehend the energy that must be given to secure the early presentation of such a report. I desire on the part of the members of the Board to express

our sincere thanks for his promptness in this regard. The fruit growers, and people of the State engaged in kindred pursuits, who can profit by these reports, and those especially who have contributed nothing towards the knowledge therein contained or the labor of compilation, should feel grateful for the privilege they enjoy in their perusal, and in obtaining such valuable information. We, the guardians of the State appropriation, receive no compensation for our labor and time given to the management and production of this work.

The reports contain essays by the most intelligent and largest fruit growers of the State, comprising the matured experience of years, failures as well as successes; and discussions by equal authority and entitled to equal attention. They treat of every branch of fruit industry as now carried on in the State, and every part of each branch, from selection of varieties to planting, and to the manipulation in every particular until the perfect fruit is presented for sale in the different markets throughout the country. In many cases the localities adapted to the successful culture of certain fruits are well defined, so that the fruit growers have at their command all the knowledge that has been obtained by the best experience. I call the attention of beginners to the reports, and repeat what I said in my first opening address delivered in Los Angeles, November, 1885: "If we expect to succeed in our fruit enterprise we must read."

The first law in the interest of horticulture was passed on March 4, 1881. A Horticultural Board soon after was organized. Prior to this organization very little united action had taken place in our State. It is true there were a few men who, as pioneers, were struggling to establish the importance of our horticultural interests, and by their publications had created that interest which secured the legislative Act, with the necessary appropriation.

I referred to this subject in my opening address before the Santa Barbara Convention, held April 9, 1888, to be found in the Biennial Report of 1887-88, pages 163 and 164, to which I call your attention:

"At the first inception of the law, fruit growers were groping in the dark, their operations were mere experiments, the results uncertain. To-day there is no uncertainty amongst the intelligent fruit growers; many branches of the industry are now a science well mastered. I venture the assertion that nowhere in the world is the business so generally and so well understood as in California. The dissemination of important knowledge, the progress made, has reached the most isolated fruit gardens, as well as the most princely orchards. Fruit growers vie with each other to discover new facts, and to disseminate them; we are united; our mutual efforts have secured for us this year a success beyond our most sanguine expectations. It is the result of our united efforts."

I think you will bear me out in the assertion that this decade marks a greater advance in horticulture than any century heretofore in the world's history. I do not wish to be understood in this statement to claim for our generation a superiority of intellect. Other circumstances have contributed to our progress—the nation, our republican form of government, the freedom and liberty of our people, our public schools. In my early schoolboy days, at the beginning of the public school system in the rural districts of Pennsylvania, it was quite common to have young men from twenty to thirty years old in these schools taking their first A B C lessons. At that time it would have been impossible to

disseminate scientific knowledge of agriculture or horticulture. How different it is to-day! In our State the most humble citizen, in his preëmpted rural home, has access to literature, and understands and practices the most improved methods that lead to success in his business. We ought to be thankful that we have such a country, such a government, and feel a deep sense of gratitude for all the blessings that we enjoy.

As successful horticulturists we meet here on common ground. There is no party politics in the production of fruits. We have to deal with the inevitable laws of nature and comply with all that she demands. We, of course, do not wish to undervalue or discourage the zeal of our people in the political controversies that take place periodically by the partisans representing the different policies of the most advanced system, because it is the safety of the Government, and without good government there can be no continued material prosperity. We, as Americans, can never be too deeply impressed with the fact that whatever evils or defects are observable in our institutions, it is within our power to remedy or remove them. We could easily draw from retirement our best men, and invest them with the offices and responsibilities of administration. Judge Story has said:

"Republics are created by the virtue, public spirit, and intelligence of the citizens. They fall when the wise are banished from the public councils because they dare to be honest, and the profligate are rewarded because they flatter the people in order to betray them."

I hope and trust that I may live to be with you at the end of the next decade, and that we shall have the same prosperous condition, witness comparative like progress in the advancement of all our interests, enjoy an equally advanced government, and that intellectually, morally, and spiritually we shall more nearly approach the divine.

At the last Convention held in Los Angeles, citrus culture elicited a very warm and general discussion. The different theories concerning the best manner of propagation would tend to create a doubt, in the minds of those about to plant orchards of oranges or lemons, as to the proper root upon which either should be grown. To me there appeared to be but little positive knowledge on this point. The range of opinion amongst the most intelligent growers is too wide to warrant successful results in the enterprise. More care and serious thought must be given to this subject. People are rushing into citrus culture more rapidly than the home nurseries can produce the trees. It will be found that the stock imported from China, Japan, or Florida is unsafe. In each case the nurserymen have no interests in the results. They desire simply to sell their stock, knowing that they would not be held responsible in the event of the early death of the trees or the spread of dangerous insect pests. Every planter should have the trees grown in his own neighborhood, or near enough that he could ascertain by trustworthy information from what seed they were produced, the manner of propagation, of budding, and the care given to them while in the nursery.

The preponderance of opinion seemed to favor the sour orange root for both lemon and orange, but this was questioned on the ground that the best citrus results could not be obtained by the passage of the sap through the orange root; and that, on the other hand, sweet oranges of superior quality could not be produced by the sap passing through the sour orange root. In regard to the function of the roots as a means of

transmitting the sap, or the chemical action that must take place before the perfect fruit is formed and matured, I will not enter into discussion at this time; but a very important question arises as to the seeds, even if we admit that the sour orange is equally adapted for both fruits. From which sour orange shall we get our seeds? There are in Florida sour orange trees adapted to the low, wet lands. In the West Indies we have the native sour orange in the high valleys and on the mountain slopes, where the land is well drained, growing into immense trees without irrigation, and adapted to a climate having two dry and two wet seasons each year. It would seem that seeds from the fruit of such trees would be more desirable. Baron Ferd. von Mueller, the great botanist of Australia, has said that an orange tree well planted and well cared for will give fruit for a period of two thousand years. A gentleman friend of mine told me that he saw an orange tree in Mexico that bore twenty thousand oranges in one season. In the employment of our time, and in the expenditure of our money, we should give our best thoughts so as to procure the greatest and most lasting results.

In our last report, at pages 97-104, will be found a most interesting essay on "Olive Culture," by C. F. Loop, of Pomona. In referring to this essay, I wish simply to call your attention to the various names of selected varieties that he recommends, and state that there are such a multiplicity of names by the different writers in the different countries, that too much reliance must not be placed in them. It is only by our own experience that we shall gain the knowledge so much desired, viz.: What variety produces the best fruit for making oil and pickles?

Many have been led to believe that our Mission olive is a seedling, and that there are many better varieties. The early priests or founders of our missions were too intelligent, and knew too well the value of the olive to risk the seeds, and if we were to draw any inferences from their work, we would naturally conclude that they probably brought the best variety that could be obtained. I certainly would incline to this opinion.

The Mission olive is a most excellent fruit both for oil and pickles, and we should proceed cautiously until we discover a better.

Insect pests menace our business. Their ravages are the greatest drawback to our success, and notwithstanding our experience we advance very slowly in counteracting them. We have had just one lesson. That lesson should impress us more seriously. It is nature's remedy, and on which we will be compelled to rely sooner or later to save our fruits. I have reference to the Australian beetle (*Vedalia cardinalis*), the importation of which achieved the almost complete annihilation in one season of the *Icerya purchasi*, the worst and most formidable insect pest ever known to civilization. Our largest citrus growers, who, one year ago, contemplated bankruptcy, and the complete destruction of their orchards, now rest without anxiety in the full confidence that their orchards are saved, and that they will be protected from the ravages of the *Icerya purchasi* in the future by this ladybug.

I call your attention to my opening address at our last Convention held in Los Angeles, to be found in the last report, pages 39 to 41. I most urgently recommend that we pass a resolution, as the sense of this Convention, asking for an appropriation of \$10,000 from our next Legislature to defray the expenses of an entomologist to Australia and adjacent islands to procure the parasitic insects as mentioned in the address referred to above, and that a committee be appointed to have the matter

in charge. We have repeatedly memorialized Congress asking for an appropriation for this object, commencing with the Riverside Convention, held in April, 1887, and at each subsequent Convention. We have not been successful, and it will be wiser to rely upon ourselves. The honorable Secretary of Agriculture will, without question, give us every aid within his power, and furnish us an entomologist with sufficient experience to assist us in the work. Let us not delay further in this matter. I hope to be able to report at the next fall Convention a second lesson.

In consular report of March, 1890, No. 144, pages 480 and 481, our Consul, Chas. F. Johnson, at Hamburg, says that the chemical Board of Examiners declared that large quantities of American sliced (dried) apples contained oxide of zinc, free from water, in such proportions as to be pernicious to health. The police department stopped the sale of such apples, and the dealers still had them on hand December 24, 1889. This, if true, should claim our most serious attention. Our interests are too great to be jeopardized by any such drying process, and our condemnation of the parties concerned cannot be too severe. This recalls to me a suggestion made at the Convention held in National City, April, 1889. I refer you to the Annual Report of that year, page 329. I recommended that one of the important measures to be adopted by the fruit growers was fruit inspection. Perfect fruit is always salable in every market. The success of the vast majority of fruit growers depends upon a combination that will secure to the consumer a good, wholesome article. There must be no doubt on this point. To surround our business with the necessary safeguards that will protect the industry, we must have fruit inspectors invested with the power to confiscate all poisonous or seriously damaged fruits, green or dried. It will take many years to arrive at proper rules or laws of inspection, hence the necessity of early commencement.

I submit these suggestions for your consideration.

THE WORLD'S FAIR.

The following communication was read:

SANTA ROSA, CAL., November 13, 1890.

To the honorable State Board of Horticulture, Santa Cruz, Cal.:

I regret exceedingly my inability to attend this meeting of your honorable body, where, I feel, so much valuable information will be accumulated. Of all pursuits, I regard that of the horticulturist the most pleasant, profitable, and honorable, and hence it is the duty of each of us to promote its interests.

I am now one of the World's Fair Commissioners at large, and our next session convenes on the very day yours does, November 18, 1890, and as very important action will be taken at this meeting, especially to the Pacific Coast, I deem it my duty to be present on the first day. Should your Convention take any action (which I think it should) urging the World's Fair Commission to set aside horticulture as a separate department, and not combine it with agriculture, then I would suggest that you telegraph the same to me or to the members of the Commission from California, at Chicago, that we may use it at the session. As one of the horticulturists of this State I am personally in favor of having horticulture as a distinct department at the World's Fair.

Yours truly,

MARK L. McDONALD.

MR. AIKEN: It seems at present they have a Department of Horticulture and Agriculture, which makes it a very large department; Mr.

McDonald desires a request to the World's Fair Commissioners to form a Department of Horticulture by itself. The response you can make to it is this resolution, and I move its adoption:

To the honorable the World's Fair Commissioners, Chicago, Ill.:

The Fruit Growers' State Convention of California, assembled at Santa Cruz, this twenty-first day of November, 1890, respectfully request that "horticulture" be made a department in World's Fair.

Adopted, and ordered telegraphed to Chicago.

COMMUNICATION.

The following letter was then read:

DIVISION OF POMOLOGY, U. S. DEPARTMENT OF AGRICULTURE, }
WASHINGTON, D. C., November 13, 1890. }

Mr. B. M. LELONG, Secretary State Board of Horticulture:

DEAR SIR: I have just received from your office a published announcement of the meeting of your Board at Santa Cruz, beginning on the 18th instant. It would afford me great pleasure to attend one of your meetings, and I hope at some time to do so. Will you be kind enough to express to your members the great pleasure which it will afford me at any time to do anything to assist in advancing the horticultural interests of your State. Rest assured that this division is endeavoring to serve the fruit growers of the country in an acceptable manner, and I only wish that there were more funds at my command to assist in this way. The recent special Consular Reports, which have been published in bound form by the Department of State, in answer to your question regarding fruit culture in foreign countries, is a most valuable publication, and if I but had the means at my disposal to bear the necessary expenses I could introduce from foreign lands a great many valuable fruits. At present there is not one cent I can use in this way except the little which I may be able to take from the regular appropriations of this division, which are small, and not appropriated for that purpose.

I find from the Department of State that there are no more copies of the Consular Report for distribution, and I have prepared a letter, which the Secretary has signed, asking that a second edition of not less than five thousand copies be issued, because I think it ought to be widely distributed among the growers of tropical and semi-tropical fruits especially.

Very respectfully,

H. E. VAN DEMAN,
Pomologist.

Recess was then taken till 2 o'clock P. M.

AFTERNOON SESSION.

FRUIT CULTURE; VARIETIES TO PLANT, AND NEW FRUITS.

PRUNE CULTURE.

By W. H. AIKEN, of Wrights.

The prune growers of California have reason to feel encouraged at the present and future prospects of their great industry. They have to be congratulated especially upon the protection of 2 cents per pound the Government has granted in the new tariff law, in answer to their persistent efforts and petitions to Congress for many years. This government aid is proper and timely as a protection to the American prune against the foreign prune raised and prepared for our market in great

and increasing quantities by cheap labor. Unaided in competition with foreign prunes for the American market, Americans would fail to make a living and pay American wages.

As to the policy of protecting manufactures by high tariff, there may be honest doubts, but there should be no reasonable doubt as to the propriety and justness of the protection of the prune, a product of our soil, requiring so much skilled and expensive labor in this country.

The soil and climate of this State are better adapted to the growth and preparation of the prune than those of any other State in the Union, and upon this great and growing industry our country can depend for a sufficient quantity of this healthful food fruit at such reasonable prices as are consistent with a just reward for the enterprise and expense. With a reasonable certainty of permanent protection we can safely enlarge our prune orchards, increase the care and expense of prune culture and preparation for the market of the United States without much fear of overproduction.

Increase of production and competition will no doubt result in cheapening the fruit and increasing the consumption, the demand ever in advance as we believe of the production, thus assuring the producer good profits. The crop of prunes in 1890, comparatively light, will not supply much more than one tenth of the demand for California prunes at reasonable prices, so there can be no immediate danger of overproduction.

The prune of commerce in France, known under the name "Prune d'Ente, or d'Agen," first grown in California at San José by Louis Pellier, in 1857, has become the prune of commerce in California, and is successfully competing with its French ancestor for dominion in the prune market of the United States.

The California prune is already the favorite at an advance of about 2 cents in price, owing to its rich, fruity flavor and bouquet, and especially to its endurance or quality of keeping for years without much if any loss of weight and condition. The foreign secret of preserving and packing prunes is practically unknown to us, and they may keep it if they wish, as we do not need or care to know what it is. One thing is certain, we have built up a trade and demand for the California prune in this country, and foreigners are actually trying to get our trade away from us by an imitation of our simple methods of preparation and packing for market.

The California prune is simply a dried fruit, not a foreign cooked fruit. Our prune is prepared and marketed usually in this manner: The fruit is gathered when ripe and placed upon drying trays in the open air, after having been dipped in hot lye water and rinsed in clear water, in order to crack the skin and cleanse the fruit. A week of our usual September weather will dry the prune sufficiently for the bin, when, after sweating for about two weeks and dipping in pure hot water, it is bagged or boxed for the market. The fruit should be perfectly ripe and perfectly dried; the process is simple, and can be easily and neatly accomplished. By "perfectly dried" is not meant dried to kill, but only dried to cure. Driers are used when sun-drying is not practicable. Grading the prune either before or after drying is quite generally practiced, and is advised.

The prune grown in California is no doubt the true prune of commerce grown in France; the slight differences in color, taste, and size

are owing to the heat, moisture, and soil where grown. The tree is hardy and prolific in annual crops, and can be profitably grown in most of the fruit districts of the State. There are no doubt prune districts where soil and climate combine to produce an abundance of fine, large, rich fruit, and where sun-drying is successfully practiced. The number of such favored spots have increased year by year, and are now too numerous to mention. The root upon which the prune should be grown depends upon the nature of the soil and lay of the land. The prune budded upon the peach root is preferred for planting in light, warm, well-drained soil, while the plum root is usually grown in land not adapted to the peach root.

The loss of trees from excessive moisture has resulted mainly from planting the peach root in soils not adapted to such a soft, spongy root, and also from planting the root *too deep* in the ground. The heat of our spring sun warms the soil about the root; the natural flow of sweet, healthy sap starts the tree into a thing of life, of beauty, of blossom, and of profitable fruit. Whenever you have doubt about your land being suitable for successful prune culture, owing to death of the tree or failure to bear in the vicinity, you had better raise some other kinds of fruit that have been successfully grown.

The training of a tree, year by year, in the way it should grow, requires thought and industry. No definite rule of action can be given as to the pruning of the prune tree, grown, as it is, in such a variety of soils and climates. Beauty of form, bearing space, and strength of limbs are of first importance, and any system of pruning that will lead to these results and not crowd the tree with too much wood and consequent small fruit, is worthy of careful study and practice.

Having read a paper before the Sacramento Convention in 1885 upon prune culture in California, in which the uses and values of the several kinds of prunes were fully discussed, it is not deemed advisable at this time to speak of any prune other than the one known to the trade in this country as a "prune."

DISCUSSION ON PRUNE CULTURE AND METHODS OF PREPARATION.

QUESTION: What is the proper depth at which to plant prune trees?

MR. AIKEN: The rule as practiced in this State is to plant a little deeper than they are grown in the nursery, so that the dirt may settle around the root. It is generally the practice to place the cut side where it was budded toward the north, so that the sun will not burn it. As to the question asked as to pruning, that opens up rather a broad subject, which will be discussed later in the session.

MR. STEWART: Nothing has struck me more about the prune than the admirable prunes we grow in California for stewing. I have been accustomed to the fine dessert prunes produced in Algeria, from whence they are brought to Bordeaux and there prepared, and they are sold from one to four shillings, equal to \$1 a pound.

MR. AIKEN: I will say in answer to Mr. Stewart, as I said in the essay, that we raise a California dried prune, not a foreign cooked prune. When he speaks of a dessert prune he is speaking of the French cooked prune to be eaten as dessert, and our prune is a dried fruit to be cooked

as a dried fruit, and our Eastern market now demands that dried fruit in preference to this dessert prune. We are not raising dessert prunes in California.

MR. BERWICK: I would like to ask you if you have enough sun here to dry your prunes without a drier.

MR. AIKEN: We have no driers in this vicinity; we dry them in the sun. Immediately on the coast very few prunes are raised at present; a few are raised in Soquel and vicinity, and there they have a drier. But our prunes are raised principally in the mountains at an elevation of probably one thousand five hundred feet, beyond the frost, in the sunlight and warmth; and in the Santa Clara Valley they also dry very well in the sun, so I think that in the prune districts of the State you can say almost universally that the prunes are dried in the sun.

MR. KERCHEVAL: I would like to ask if any one here has observed the peculiar condition of the prune this year. I was informed yesterday by a gentleman of Pomona, that the orchards in that vicinity were white with bloom at this time, and I would like to know if the same condition of things exists in orchards in other portions of the State, and if so, to what is it to be attributed?

MR. LOCKE: There is an old adage that a man who understands power, and knows how to use it, is a wise man; and I would add that the fruit grower who understands his soil, and knows how to use it, is also a wise man. The question has been raised here as to how deep trees should be planted in the soil. One has advised a little deeper than in the nursery. I do not remember if any one has contradicted that, but you will find in the catalogues given by nurserymen, giving directions for fruit growing, to plant your trees no deeper than they came out of the nursery, if you can find how deep that was. You have got to understand the soil. I have had many people ask me how deep to plant trees. I tell them, "Well, I don't know; I do not know your soil. If your soil is dry, and will drain off easily, then, perhaps, a little deeper—not much—than they were planted in the nursery." But then, you see, I would have to know the kind of soil they grew in; but still there should not be much difference made. It is a pretty good rule to go by to plant a tree just the same as it comes from the nursery. I have an orchard myself in the place I now live, and one would say, to look at this soil, that it was a heavy, wet soil, and that in a wet winter trees would be likely to be killed out by the water; but there is the mistake—they don't understand it at all. You dig down and find that as soon as you pass through this you come upon a coarse subsoil and clean gravel, in which the water drains right off. Now, I found in putting out a young orchard some eight or ten years ago in another place, one hundred and fifty feet higher than the old orchard, where any one would say, not knowing what the subsoil was, that if you put them lower than the nursery you will suffer, because you will be troubled with the water; but it was just the reverse. Where I put the young trees the subsoil is impervious to the water, practically, and when it rains like last winter the water stands on the surface, and the consequence is I lost ten trees there where I lost one in the other. It is a matter that must be investigated before we can give a man any directions. I would rather tell the man to plant the trees on the top of the soil, and plow around them and dig down around them for some distance, than to tell him to put them deeper than they were in the

nursery; I would tell him, as a rule, to put them the same as they were in the nursery. One thing in regard to what Mr. Stewart has said with regard to prunes. People don't always want the sweetest thing in the world. A sweet apple you can scarcely sell in this State. The kind of fruit that takes the best in America is that which has a little acid and sugar too. In reference to pruning, each man must prune to suit himself a great deal; but I have noticed that where the limbs were allowed to grow very low down they would be so full of fruit that they would almost lie down on the ground. I have seen apple orchards and pears do the same thing, and, of course, that is not the way to treat trees. Those who advocate low pruning would not allow the trees to bear so much as that, but when you undertake to thin out prune trees you have got quite a job on your hands; and what are we to do when they do that way—cut them back? If so, they will grow out the more; it is pretty hard to get around them that way. I have noticed some growers raise trees higher, especially apples and pears, so that they can get around among them. It is more advantageous to have them that way than to have them so low down that you can't get around among them; while it is more advantageous in picking to have them low down, still I think it is more than balanced to have them up to cultivate.

MR. MOSHER, of San José: In planting trees I would like to call your attention to one point, and that is the manner of planting the trees. It is customary with me when digging a hole for a tree, to take the dirt down as far as we plow, or the dirt that is exposed to the air, and lay it carefully on one side of the hole, then digging farther down in the hard dirt and putting that on the other side; then when we plant the tree we are always careful to put this top dirt in the bottom of the hole and around the tender roots, and then fill up with the hard dirt that comes from the bottom. The dirt that is thus put around the tender roots is warmer and we consider it an advantage.

MRS. L. U. McCANN, of Santa Cruz: As to the planting of trees, if you make a little hill of the surface dirt in the hole you can settle it right in and around the roots, leaving no air pockets, which is much better. I would like to ask the gentleman who read the essay (Judge Aiken), why he made no mention of the little mixture of glycerine with the last dip of those prunes, since it is said to give a shine and sort of finish to the prune that nothing else does. If we can by a little glycerine give that shiny and fancy blush, you know that brings the money that Mr. Stewart was talking about. Glycerine is not a very expensive article, and some people think it is healthy. About the pruning of the tree, the expense of cultivating one's orchard is necessarily graded by the amount of work that you do with the horse, and the low-cut tree necessarily means a great deal of hand spading, hoeing, and grubbing, which horse work has nothing to do with; therefore, I hold it is good policy, until our pockets become plethoric, to trim our trees a little bit higher, so that cultivators and plows which have the side action can be used to save hand labor. I know in some of the hot valleys it is necessary to shield the fruit as well as the ground from the intense heat, but in a properly pruned tree—and I hold, in having brought up nine children, I know something about a tree, I believe in taking off the switches when they are little—I believe that you should not wait to prune trees until you have to bleed them to death by sawing off big limbs, but like the typical child, train the tree while it is young

and it won't need very much when it is old, except the taking off according to the growth of the tree. If it is in some very fertile spot and has grown extraordinarily, say two or three yards, you need, perhaps, to cut back a little more than where the tree has been stunted in its growth. If you are going to be a fruit grower you have got to use some good common sense, and you have got to treat trees and plants as individual entities; no rule that you are going to set down in a book is going to apply to all your orchards; you have got to stand and talk with a tree a little bit and find out what it needs, and if it is growing on one side, lop it off a little and let it grow the other way—never mind your crops, let it do its own cropping. I believe the rule I have found best in pruning my trees is cutting off one third of the season's growth, trimming it back and making it a little bit stocky, and avoiding those long whip-stems that break the tree, and the crotches that split a tree, for I find that the triple bending of the limb, where you have three buds, makes trouble; for wherever a careless pruner leaves forks on each side it requires neither prophet nor philosopher to know that when the tree becomes overloaded it will split. One other question: I would like for experienced prune growers to tell me why my prunes split; I would like to know what to do to prevent it.

MR. AIKEN: In reply to Mrs. McCann as to this glycerine treatment practiced by some, it is not deemed advisable to recommend anything except pure water, because an addition of glycerine might lead to other adulteration, such as the adding of some bluing or other things to give them a blue-black color; that has been attempted. We do not advise prune growers generally to treat their fruit with anything except pure water, although there is no objection to glycerine in itself. As to pruning, as has already been said, there is no rule to apply to all cases, because in some soils the growth is very long and the prunes grow very high, and need a different treatment than in richer soils where the growth is very slow. I certainly cannot add anything to the wisdom of her pruning, only where the three branches come together we usually take out the center one so as to leave the other two, strongly fixed, to grow into branches.

MR. CHASE, of San Diego: I am somewhat interested in the prune business. Although I do not profess to be a horticulturist, I have paid some little attention to the prune business, and my investigations upon the subject have led me to believe that there is no prune produced in the known world that has been dried and put upon the market which compares in quality with the prune that we are producing here in California. You have but to take the best French prune you can find, and compare it with ours, to see that the proportion of pit and skin in it is 25 per cent more than in ours, and that the saccharine matter of the prune raised in California is fully 25 per cent greater than that found in the best imported French prune. And, sir, to demonstrate that I am not mistaken in this, I have only to refer you to our Eastern markets. What has enabled us to get from 2 to 2½ cents per pound more for our prunes in the New York market than for the best prune that is brought there? Simply because it has been demonstrated beyond peradventure that we raise a better prune than they do, and that they have no prune that compares with ours in quality; and here is one of the great sources of the confidence of the prune raisers in California. Years past our demand for prunes was limited to the lower grade, to the restaurant, to

the boarding-house, to the laboring man—very few of them were found upon the tables of our more wealthy citizens, those who indulge in the luxuries of life. But that is changed now; they find in the California prune something worthy of the best table, and it is opening up a market for us, and that market is increasing faster than our supply, at the prices stated. And I question very much, Mr. President, whether that 2-cent tariff has very much to do with it either. Those who desire our prunes will have them, and they will have them at whatever price they have to pay for them; and to-day, if the product of California was greater than is demanded in the United States, we could send it to England, and it would compete successfully with the French prune. It is not many years since we saw in the paper that some of the French producers were over here studying our system of packing prunes, and they declared that they would come over here and compete with us by following our system; but they could not get the saccharine matter in them, and that is where they failed. Now, sir, I do not know what the farmers of California would have done if they had not been protected by this tariff this year—poor, feeble, struggling industry, struggling against free labor, as you suggested. Why, sir, I had five acres and a half of prunes this season in my ground; they were five years old from the graft, and I had expended upon them in taking care of the prunes, cultivating the ground, pruning my trees, and drying the fruit, about \$250, and when I came to sum up my receipts from the sale of the fruit that I took from them, it only amounted to \$2,700, and what in the world would I have done had I not been protected? The dessert prune has not been put up by us. It may be that there is a particular kind of a prune put up in France that we haven't got, still I have never eaten a prune anywhere that was equal to the California prune.

MR. ALLEN, of San José: I have a prune orchard, and in one part of it, about one eighth, on a clay soil, somewhat wet, my prunes crack; in no other part of the orchard do they crack, and I have concluded that the wet, clayey soil and the cracking of the prune have some sort of relation of cause and effect. In investigating the subject I have learned that they are very likely to crack on the heavy adobe soil, and that it is true that they do not crack on a very generous, sandy soil, especially with a gravelly subsoil, and I thought that that might possibly be a hint towards answering the question with reference to the cracking of the prune, which is a serious defect, because it destroys largely its marketable value. I know from absolute knowledge that two years ago four tons of prunes from the summit of the mountain ten miles from here were purchased at San Francisco—at 8½ cents per pound, cooked, prepared, and sold at 25 cents per pound as Bordeaux prunes. I do not think it is a difference in the prune, it is a difference in the manipulation. They were cooked, they took on the French finish and the French label, and went as a dessert fruit, and were exceedingly acceptable, and our friend (Mr. Stewart) if he had applied at the right place, could have got "Bordeaux" prunes raised on the Santa Cruz Mountains.

MR. CLARK, of Santa Cruz: Perhaps I can assist in elucidating the question of why the prune cracks, and do so from practical observation in Placer County some two years ago. At that time I owned a large ranch there known as the Gould Ranch, and a large number of prune trees were scattered amongst the peach and apple trees. Irrigation was pursued on that ranch, and these prune trees were so placed that it was

impossible to irrigate without irrigating them, and those trees had cracked prunes. It is the access to water in too great a quantity at the time that the prune ripens. I judge this to be the case from the fact that some few trees on that ranch were not so exposed, of the same kind of French prune, and they did not crack. Two years in succession I made the observations which I state, and I have made some inquiries this last year, and found that where they are cracked badly they have been in low, wet ground, or where the soil held water, or where the root could go down and get moisture about the time of the ripening of the fruit. As to pruning, no tree is properly pruned if the pruning is followed beyond the fourth year. If you do not shape your tree in that time, considering the soil it is in and the character of the tree, you never will have a tree that you can prune properly or to your satisfaction. If your soil is light or the tree needs shade, you must of course prune it low; but I think in order to get at the trees so as to cultivate them properly, where you have a soil that needs shading in a hot, dry climate, it would be better to plant them close together and obtain your shade by a little greater height of the tree; they will support one another under such circumstances, and yet you can prune them so that they will not be too high; they will not droop down if they are pruned properly, but will keep stocky, and it will not interfere with the gathering of fruit.

MR. BERWICK: I have just what Professor Allen describes—a rich loam with gravelly subsoil—and yet my prunes crack. They should not do so, but they do, and more, they mildew after they crack. I thought the cause was the moist air—I am in the fog belt in Carmel Valley—and I put the cracking down to the moist air and the fog. Now, I believe in low heads for fruit trees. I find the cost of plowing and the cost of hoeing around the trees is not very great, but I find climbing stepladders is very unpleasant, both in pruning and in picking, and I would rather have the head of the tree accessible to the ground than to get pretty close to the trunk and be thirty feet up while picking the fruit.

MR. STEWART: I know something about Mrs. McCann's place, and in my mind the trouble there arises from too much clay in the soil; and secondly, the moist air, and I think the best thing she can do is to dig the prunes up, for she will never get any profit out of them in that situation.

I. H. THOMAS, of Visalia: I object to the moisture of the soil being the cause of the cracking of the prune. In the Briggs orchard in Tulare County, where they raise fruit without irrigating, there is no time in the hot summer season but you can go and kick the soil and it is perfectly moist, and at three and a half or four feet there is water, and that produced the finest crop of prunes ever produced in the State—as high as eleven hundred pounds on a six-year old tree—and there is no cracking of prunes there; so I do not think it would be the excessive moisture, unless it is from the atmosphere, and not in the soil.

PRUNING THE PRUNE.

MR. SMITH, of Napa: I read frequently, in regard to the pruning of the prune tree, that it is claimed that after the fourth or fifth year it should not be pruned. I should like to hear from those who have had experience in that, because I have trees just about that age.

MR. ALLEN: Have you observed how much growth your five-year old trees have made beyond the bearing wood this year?

MR. SMITH: The fourth year, sir, and they have made an average, I should say, of three to four feet.

MR. ALLEN: I think nobody would question that they should be cut back, but the fifth year they will grow less than half of that, and the sixth year still less, and then I think they should not be cut back and nothing taken out except the water sprouts, and you may even find it best to leave those to take the place of a faulty limb.

SOIL FOR PLANTING THE PRUNE.

L. W. BUCK, of Vacaville: There seems to be a good deal of inquiry as to how and what to do to raise fruit, but I think that the keynote has not been said by any one here this afternoon; that is, first be sure that you get good land to plant on. I believe that a man would do better to buy at a high price good land to plant fruit trees on, than to have poor land given to him. Nor can you, as the gentleman has just now said, reverse the soil with any very satisfactory result. You may start your tree for the first year a little better, but later it will strike the poor soil if it is there, and it will fail to produce fruit that will bring a good price, and the time is past for selling a poor quality of fruit in this State for a paying price. You have got to get land upon which you can raise fruit. I believe the lady over here to my left (Mrs. McCann) has struck the keynote as near as anybody that I have heard this afternoon. I believe a tree should be pruned, and pruned thoroughly, the first two or three years after it is planted, and after it commences to bear the growth will be less. The ranker the growth, as a rule, the less fruit you will get, until the strong growth is overcome and the tree becomes large; then it will bear a heavy crop of fruit. A tree that makes a stunted growth always makes more fruit than one that is vigorous while young, and in order to keep a tree in such condition that it will not break, you have got to form a stiff, strong body, and so with the first branches that starts from the body; after that is done your tree will very seldom break. Now, in my experience I have seen several young orchards in this State that were planted on good soil that have been almost absolutely ruined by being left to bear without being pruned or thinned the third and fourth years. Men have said to me, "See what a crop I have got; I have got a larger crop of fruit than my neighbors on trees not four years old." And when their trees were four years old they were almost absolutely worthless.

MR. MOSHER: I would like to ask Mr. Buck if, considering the land was very good, he would not reverse the soil when he thought it was practicable to put the warm soil underneath?

MR. BUCK: If your soil is very good you may take and throw your tree into the ground, I don't care how, it will grow. I don't believe it is any particular advantage in reversing it. Now, as to the depth of planting trees, I will plant them certainly as deep or a little deeper than they were in the nursery rows.

CHERRY CULTURE.

By ROBERT HECTOR, of Newcastle.

It is undoubtedly because of my connection with what has come to be regarded as one of the horticultural wonders of California (the Hector cherry orchard on the American River, in Placer County), that I have been requested by you to formulate my views upon cherry culture.

I am pleased to accede to your request, although I do not pretend to be an authority on the subject in a general way. As I shall explain, my experience has been of a special kind. This may be of but little help to others, although it may be of some interest. The very unusual growth of the trees which I own, and their exceptionally large crops, and consequently large returns, have caused many inquiries to be made which it has not always been convenient for me to fully answer, and I am glad, incidentally with this paper, to give the history of the grove in question.

Early in the "fifties" the rich auriferous gravel deposits of that portion of the American River Cañon about Manhattan, Rattlesnake, and Horseshoe Bars, had attracted a large population of miners. Among others drawn by the common loadstone was Dr. L. E. Miller, a German of education and culture, who in the "fatherland" had acquired a love and knowledge of gardening and tree growing, that here, in a sheltered nook on an alluvial bench near the river's edge, he found means to indulge in and carry into practice. Beginning as an amateur, he found that his favorite pastime was a profitable one, the mining camps furnishing a very convenient and remunerative market. His garden and orchard increased in size, and in the spring of 1854 he imported from France, and planted, the cherry trees which form the older portion of the orchard I now own. Mr. J. Bost, at present a resident of Nevada City, a brother-in-law of Mr. Miller, dug the holes and otherwise assisted in the planting of the trees, and from him I learn that they were originally planted in squares, twenty feet apart. The gradual growth during the thirty-five years has rendered necessary a gradual thinning out in the rows, so that now in places there is but one row occupying the space originally occupied by three.

Casual inspection would hardly determine which trees have grown to the greatest dimensions. Measurement shows, however, that the largest tree is sixty-five feet in height and the branches cover a space of sixty feet in diameter. The trunk branches about six feet above the ground, and here has a girth of over ten feet. This being the largest tree, is the one I have naturally kept the closest record of as regards its crops. It is of the Black Tartarian variety:

The crop of 1886 amounted to	200 boxes of 10 pounds each.
The crop of 1887 amounted to	180 boxes of 10 pounds each.
The crop of 1888 amounted to	300 boxes of 10 pounds each.
The crop of 1889 amounted to	220 boxes of 10 pounds each.
The crop of 1890 amounted to	300 boxes of 10 pounds each.

Prices have varied somewhat during these years. The tree matures its fruit early for its variety, and the prices received for its crop have been good. The first cherries picked from it for some seasons brought as high as \$4 per box. They have averaged during the years mentioned at least \$1 50 per box of ten pounds. The crop of this tree for the past

five years has therefore sold for a gross total of \$1,800. Inquiry made by me in France and Germany has failed to bring to light a single instance of a tree having a record at all comparable with this. Some of its neighbors will closely approximate it, but how nearly I have not kept the records so as to determine, the hurry of the picking and packing season rendering it a very difficult matter.

As these results are exceptional, we shall of course look for exceptional natural causes, and we shall not fail to find them. The tree grows in a bank of rich alluvial deposit, which may be described as a sandy loam. It is located above the north edge of the bank of the American River, which here in its winding runs almost due west. It is in a valley formed by the depression between two spurs of the ridge which forms one side of the river cañon. This valley is sheltered by hills on the east, west, and north, and open to the river on the south. It is, therefore, protected from cold winds, and has the advantage that southerly exposures always have. The soil in its quality is exceptional, and its depth is undetermined. In the year 1852 or 1853 a test pit was dug to ascertain the possibility of reaching the gold-bearing gravel that might lie beneath it. The shaft was sunk to a depth of sixty feet through sandy loam without reaching the desired material, and was then abandoned.

The top of the bench or table upon which the orchard is situated lies about forty feet above the level of water in the American River at its ordinary stage in summer. My records of temperature are somewhat meager, but sufficient to show the results of the protection afforded by the peculiar location. During the severe cold weather of three winters ago, while the thermometer on the hills within a mile of this spot registered a depression as low as 18 degrees Fahrenheit, the temperature at my house did not go below 22 degrees.

The treatment the trees usually receive during a season is as follows: Plowing begins as soon as the weather will permit. The plowing is shallow, the furrows being from four to six inches deep, the cherry having many surface roots which I believe is best not to injure. The plow is followed by a disk harrow, and the latter by an Acme harrow. This finishes the cultivation. The trees were never fertilized until within the past fifteen years. It is my practice to spread common barnyard manure broadcast to a depth of five or six inches during the winter. I doubt not it would be the better practice to plow under as soon as distributed, but this has not usually been done. Irrigating is begun immediately after the gathering of the crop, the rather severe handling that each limb receives at picking time, in spite of extreme care, seeming to make water particularly acceptable as a tonic (if such a term be allowed in horticulture) at this time. It has the effect of strengthening the fruit spurs and invigorating the tree generally.

The picking is the most laborious, as well as most carefully prosecuted work in connection with the tree. Ladders of extra length, made portable by being attached in erect position to a stout pair of wheels, are generally used. These are held in place and kept steady by a system of guy ropes. Directions to pickers call for extreme care that fruit spurs and smaller limbs be not broken, that the fruit prospects for ensuing seasons may not be jeopardized.

My old cherry trees are never pruned, and young ones are not pruned after the third year. I prefer to have the limbs spread out in approximately horizontal position, my theory being that fewer blossoms have

all their pollen washed out by driving rains than when limbs grow stiff and perpendicular. I also believe that I secure more air and sunlight in the center of the tree. Where growth is rapid, as it has been with my trees, I have found it advisable to slit the bark in the fall and spring to prevent the natural splitting which results sometimes from trees becoming hide or bark bound.

In extending the original orchard, I planted seven years ago some cherry trees of the Black Oregon variety, which are now thirty-five or forty feet in height, whose branches cover a space thirty feet in diameter, and whose trunks are four feet and ten inches in circumference. I have, at different times, planted cherry trees in the granitic soil of the foothills, farther up from the river's bank, on my place here, and they have done well and matured valuable crops, but I have never found the tree growth to be anywhere near as rapid nor as vigorous as in my river orchard.

DISCUSSION ON CHERRY CULTURE.

MR. BUCK: This orchard spoken of is in a little pocket evidently made on purpose for a cherry orchard. It is on the American River, and, as the gentleman has stated, on a very fine, loose, sandy soil with a granitic formation.

MR. STOREY, of Santa Cruz: Is it proper to dispense with the plow and to depend solely upon the cultivator in the tilling of an orchard?

MR. BUCK: As to this cherry orchard spoken of, I hardly think it would make any difference whether it was ever plowed or not; it is of that loose, sandy formation that is never hard. I don't believe that there is anything to be gained by discarding the plow, and I believe that as a rule, especially in dry countries where there is no irrigation, that deep plowing is better than shallow.

MRS. McCANN: I have a little information as to the gumming, cracking, and bleeding of the cuticle of the cherry. The appearance of a black fungus and a good deal of gum coming out made me look at my cherry trees and question what could be done to make a healthier trunk and stop that gumming, which to my mind was a symptom of weakness and an indication that something was wrong with the cherry tree. I tried concentrated lye as a wash for the tree, and for one season it acted very well, but I found that the small boy engaged to do the work skipped places, and the next year I mixed a little whitewash with the lye, and the boy could see where he had skipped, and so could I. The result of that was a clean, healthy new bark on the old cherry tree, which I had thought to cut down if it didn't look better, but it improved and grew a clean, healthy bark. This superabundance of moisture or sap that made it bulge and swell, and the ugly black bark, all seemed cured by the application of this concentrated lye diluted to a proper solution. Since then I have found with my cherry trees that whenever I started my small boy with the strong whitewash I had clean, healthy bark and very little gum.

W. C. BLACKWOOD, of Haywards: As a general rule, I would say plow your orchard, and if your soil is deep plow deep, and cultivate afterwards with the harrow or the cultivator, and allow no weeds to grow. I have had a little experience in that. I purchased a little farm down

near Mountain View six or eight months ago, and agreed with the man from whom I bought to take care of the orchard this year; and about six weeks or two months ago I visited the orchard, and there was not a weed in it. He seemed to have done very well, still there was something about it I didn't like, and I went to a neighbor having a little orchard adjoining, and saw that his trees were about as large again as the trees in my orchard. I said: "How long have you had this orchard?" He said that he had been there a year; that his trees came from the same place as mine and were planted about the same time. I asked him how it was that his trees had made so much better growth. He answered: "He did not plow his orchard, and I had plowed mine;" and that settled the question in my mind. Now I agree that there are lands where plowing need not be done. Land that is probably moist does not need much cultivation or much plowing; but on dry soil, whether it be loam or gravel, I hold that it is best to plow; and if your soil is deep plow deep.

MR. BUCK: I think that one of the main objects of plowing is to form a deep mulch to hold the moisture. I have noticed with those people who don't plow, but simply cultivate, that the mulch formed by the cultivator is very thin. The result of such treatment is a small growth, and eventually the death of the tree; but always small, worthless fruit. I have never seen bad results from good, deep plowing, followed by good cultivation, making the soil a fine, deep mulch.

MR. MOSHER: The question as to what causes the gum to ooze from the cherry tree seems to me is a very important subject, and one that we should not hurry over. I think we are troubled with it all over the State, especially this season, and I would like to hear some discussion on the subject. I have a theory which I will give for what it is worth: I compare a tree to the human system; the sap of the tree would compare with the blood that moves in the human system; it circulates; and we know if the blood is impure it has got to break out somewhere. I think it is the same with the tree. I think that if we could purify the sap the tree would be more vigorous; because we know that when the sap oozes from the tree that the tree is not healthy. My remedy would be lime, sulphur, and salt. We know that sulphur is good for trees, for I have tried it on stunted trees that seemed to be dying, and then made a wondrous growth.

MR. CAMPTON: I had a tree once that was very badly affected with the gum oozing out, and a friend of mine told me that if I would put salt and water, simply brine, on this tree I could save it. I expect it was as bad a case as you could find, and I applied the salt and water thoroughly, and saved the tree; the gum stopped oozing, and the tree regained its former strength.

MR. CLARK: I beg leave to differ with Mr. Mosher in regard to the black or yellow gum which affects nearly all the deciduous fruits. It is, from close observation and study, a fungus. We have what we call the mildew in the grape, as many of you grape men have learned to your sorrow, which is known to be a fungus. Mrs. McCann speaks of the application of caustic lye having been successful with her; Mr. Mosher speaks of the use of sulphur and lime; lime is a caustic. He compares the tree to the human body; he speaks of sulphur. We know that sulphur is useful in many diseases of the skin in the human body, and the same remedy that applies in our practice applies to all fungous

bodies that afflict different forms of vegetation and cause such destruction in our orchards. The comparison the gentleman made was an apt one, and it is good that you are here to-day to listen to what he is saying in the matter of curing the yellow gum. Use your sulphur, use your alkaline wash, and you can put them together. I have thought that I would add a small amount, in the wash upon the bark of the tree, of sulphate of iron, that is, common copperas. I would get that as a primary wash, and then apply my alkali; it would destroy a fungous growth very quickly. You want to use it very weak, not to exceed a 3 or 4 per cent solution. This fungous growth on the bark of a tree is very delicate in structure, and they are very easily destroyed.

MR. MOSHER: Sulphur is not soluble in water, and we put lime and sulphur together, because it makes it slightly alkaline, makes an alkaline solution and dissolves the sulphur, and then by boiling you get a perfect combination, and unless you get a perfect combination you will not get the best results; it then enters into the solution, and you have to get it into this condition in order to have it come in contact and purify the sap.

MR. CLARK: You can obtain an excellent mixture to use in this case by using whale-oil soap, or any strong soap, as a vehicle to use your sulphur, lime, or caustic lye with. The soap renders the action of the lye more perfect; there is sufficient oleaginous substance in it to carry other agents, and there is no danger of injuring the trunk of the tree.

REGISTRATION OF FRUITS, ETC.

MR. PERKINS, of Alameda, addressed the Convention on the matter of nomenclature and the registration of fruits.

The said subject-matter was referred to a committee consisting of A. T. Perkins, R. C. Kells, and B. M. Lelong.

The Convention then adjourned till the following morning.

TRANSACTIONS OF THE SECOND DAY.

SANTA CRUZ, November 19, 1890.

President ELLWOOD COOPER in the chair.

INSECT PESTS AND THEIR EXTERMINATION—PARASITES AND FUNGOUS DISEASES.

INSECT FRIENDS AND FOES.

By ALEXANDER CRAW, Entomologist of the Board.

Entomology is a very important study for fruit growers, as nearly every branch of their industry is more or less affected by injurious insects, and the experience of the past with some of the insect pests that have been introduced into California should be sufficient to make us careful to examine and disinfect all trees and plants imported into the State.

While a knowledge of how to combat and check the injurious insects is necessary, it is also of the greatest importance that we should know our insect friends, for without their assistance, even with our united efforts for the destruction of the former, we have been unable to subdue them. Could any effort of ours, even with an unlimited expenditure of money, have accomplished the same results derived from the importation and distribution of that wonderful insect, the *Vedalia cardinalis*? I am positive nothing could; for money was expended without stint by fruit growers, not in a spasmodic way, but with a determined effort to gain the mastery over the "cottony cushion scale" (*Icerya purchasi*).

This is a very good argument in favor of the introduction, propagation, and distribution of parasites and predaceous insects, as suggested by President Cooper in his opening address before the Thirteenth State Fruit Growers' Convention, held at Los Angeles, March 11, 1890. If the insects to which he called the attention of the Convention were introduced into California they would be of immense benefit, not only directly to the fruit grower, but indirectly to the other industries of the State. So let us persevere in our search for insect friends, and not relax our efforts in securing from the State and National Governments, laws and appropriations for the carrying out of this grand work.

There are innumerable foes, but I shall only mention those that to-day are attracting the most attention.

Red Scale (*A. aurantii*, Maskell).—This foe to citrus trees is to-day the most serious pest the orange growers of the State have to contend with. In the absence of internal parasites, recourse for their suppression has been had to the application of rosin washes, and also to fumi-gating the trees with hydrocyanic acid gas. Improvements have been

made the past season in the manner of applying the latter remedy and in reducing the expenses, that will aid in keeping this scale in check until an effective natural remedy can be found; a full account of which will be found in the reports of the State Board of Horticulture for 1889 and 1890. The twice-stabbed ladybird (*Chilocorus bivulnerus*), and its larvæ, and various other species of Coccinellidæ, feed upon this scale. The larvæ of the lace-winged fly (*Chrysopa Californica*, Coquillett) also destroy great numbers.

Yellow Scale (*A. citrinus*, Coquillett).—This scale (formerly known as the red) is found in the San Gabriel Valley, and has been for years a very serious pest in that section, and caused a great loss both in quantity and quality of citrus fruits. Since the discovery of an internal parasite (*Coccophagus*) which attacks this scale, the growers have done very little spraying in that district, and the good work of this parasite is very noticeable in a number of groves, where not over three years ago it looked as if the growers had a long fight before them. The parasite is so small that it can hardly be detected with the naked eye, and parties undertaking the colonization of it upon *A. aurantii* should select a tree or trees remote from large groves, so that the trees can be left without having to disinfect them for at least two years; in that time it can be determined whether it can be bred on the *Aurantii*. In order to stock trees with this parasite, scale-infested branches should be obtained from an orchard known to contain them. It is not necessary to place the branches on the trees; the best way is to fill boxes with wet sand or earth and insert therein the ends of the branches and place them under the tree in the shade (and on this account a low tree would be preferable); in this way the branches remain longer fresh and allow the parasites to mature and hatch. As the branches dry up more should be secured and the operation repeated a number of times so that it may prove a success. A great many conflicting reports have been circulated about this parasite, but as I am conversant with the condition of the groves in that section for the past fourteen years, I know that the present healthy appearance of the trees is due to the work of this little parasite.

Pernicious Scale (*A. perniciosus*, Comstock).—This scale is also well known, and like the preceding species has an armored hard shell; but it confines its attacks to deciduous trees, and is a very serious pest. The remedies given in the reports of the State Board of Horticulture are so cheap and effective, if properly applied, that no excuse can be tolerated for a seriously infested orchard.

About ten years ago a parasite (*Aphelinus fuscipennis*, Howard), a minute four-winged fly, made its appearance in the Santa Clara Valley on the so-called "San José" scale, but so far very little good has been observed from it in that section. A few years since this same parasite was found to be doing effective work in subduing this pest in an orchard in the neighborhood of Los Angeles, and from personal knowledge of the facts I am confident that the restoration of that particular orchard is attributable to this parasite—nature's remedy. Scales can still be found on the trees, but not in such numbers as to cause any damage.

Black Scale (*L. oleæ*, Bernard).—This scale is too well known in California to require any extended notice. Attention is again called to Mr. Cooper's address at the last Convention, wherein he quotes from the report of Mr. Henry Tryon, of Queensland, of the existence of a highly

beneficial moth, *Thalpochares coccophaga*, the larvæ of which prey upon the black scale and destroy them in great numbers, and have been known to free trees of the scales. Public attention was first called to this moth by G. Masters, at a meeting of the Linnæan Society of New South Wales, in 1885. The larvæ feed at night and form coverings for themselves with the empty skins of the scales. In this connection I may state here that I have taken the proper steps to have this moth introduced, and hope, through the assistance of Mr. Tryon, to be able to establish such a friend in our California orchards. Upon this scale we have a native internal parasite (*Dilophogaster Californica*), that assists very materially in keeping this pest within bounds. From 30 to 75 per cent of the black scales are annually destroyed by them. From the fact that only one generation is produced each year, and that this parasite only attacks the mature scale, the 25 per cent that escape, each containing eggs, are sufficient to again cover the trees.

Soft Orange Scale (*L. hesperidum*, Linn.).—Previous to the introduction of this scale in the early fifties, the orange trees in California were bright and clean, as I have been informed by J. W. Wolfskill, of Los Angeles. The scale spread so rapidly, even killing some of the large orange trees, and for a few years was such a serious pest it was then thought that orange growing would have to be abandoned. Insect warfare in those days was not understood, and instead of spray pumps or fumigating tents, the trunks and branches of the trees were scrubbed with soap-suds and sand. This had a beneficial effect upon the trees. After a few years the scales diminished in numbers, and it was thought they had run their course and would finally die out. This scale still exists, but not in such numbers as formerly, and with them we find the probable cause of their decrease. This is a small four-winged chalcid fly (*Encyrtus flavus*), one of the most beautiful of this important family. The female is furnished with a sharp stinger ovipositor, with which she pierces the scale and deposits from one to seven eggs in each. In three or four days these hatch into small, footless, blind grubs that eat out the scale, and the dead scale answers as a covering for the naked pupæ. This parasite can be found all over the State. Wherever the soft scale is numerous it is owing to the fact that numbers of ants are continuously around them, preventing the parasites from depositing their eggs. To remedy this a band should be placed around the stem of the tree, and over this tie a piece of rope previously saturated in coal oil; this will prevent the ants from ascending, and give the parasites a chance. Another chalcid parasite is found in numbers upon this scale; it is the *Coccophagus lecani*, Howard.

"Apricot Scale" (*Lecanium armeniacum*).—This is another of the scales that infest deciduous fruit trees, especially the apricot and prune. It causes great damage from the amount of honeydew it excretes, and the consequent black smut that covers the foliage and fruit. Like other Lecaniums, the greater period of its existence it is soft and easily destroyed by the washes recommended for deciduous trees.

"Mealy Bug" (*Dactylopius adonidum*, Linn.).—The climate of California is too dry for this family of scale insects to ever become a serious pest. Where they appear to thrive is in a warm, moist situation, and on this account are very troublesome in hot-houses. The fact that we have three native species in this State, and not in very great numbers, would indicate that the conditions are not altogether suitable for their

increase; for, otherwise, I believe it would be as troublesome a pest as the woolly aphis. I have found plants the roots of which were covered with them. Amongst garden plants, where it is moist and sheltered, they are occasionally found.

In my experience with this pest I have found whale-oil soap the safest and most effective remedy. Use one fourth to one half pound of soap to each gallon of water, according to the class of plants to be treated; dissolve by boiling, and apply at a temperature of 100 to 130 degrees.

About five years ago I discovered an internal parasite preying upon this coccid, that was then new to science, *Rileyia splendens*, Howard. This was a case of complete extermination, for I have been unable to find either mealy bugs or parasites in that place since.

"*Cottony Maple Scale*" (*P. innumerabilis*, Rathvon).—This is the cottony scale that infests grapevines, more especially those growing upon arbors, and has frequently been taken for and reported as the "cottony cushion scale" (*Icerya purchasi*). It differs from the latter in having a plain egg sac instead of being corrugated, and the female resembles a Lecanium, and loses all power of locomotion as soon as the cotton appears. There is only one generation a year. In some portions of the State this scale has been practically exterminated by an internal parasite, *Encyrtus flavus*.

"*Squash Bug*" (*Diabrotica soror*, Le Conte).—This is one of the most destructive leaf-eating beetles we have to contend with, and from its great numbers and migratory habits it is a very formidable pest to fight, for when disturbed it will drop from the leaf and fly to some other plant. Nearly all our fruit trees are subject to its attacks, and it also eats into and damages ripe apricots. Melons, cucumbers, beans, and other soft-leaved plants suffer severely from them. They also destroy rosebuds, carnation, and pink blooms. As a remedy, when the insects first appear spray the foliage with Paris green, one pound to two hundred gallons of water; or take five ounces of Paris green and twenty pounds of sulphur, mix well and dust on the trees or plants. But in no case should either remedy be applied to vegetables.

This beetle is attacked by a dipterous parasite, and is one of the very rare instances where a beetle is attacked by parasites. Last season I found one third of the *Diabroticas* destroyed by an internal parasite which I discovered in Los Angeles. It was found to be a new genus, and was named *Celetoria crawii*.

"*Orange Aphis*" (*Siphonophora citrifolii*, Ashmead).—This is the green fly or louse of the young shoots of the orange tree, and at each of the three growing periods of the tree every season they appear in great numbers, and in some instances have checked the development of the leaves. If they become serious upon young trees I would advise spraying with a weak rosin solution. They are preyed upon by an internal chalcid fly, and also by a green grub that upon first sight you would be tempted to destroy. It is blunt behind and pointed in front. This is the larvæ of the syrphus fly (*Catabomba pyrastris*, Linn.), which is illustrated on Plate V, Report State Board of Horticulture for 1890. The female deposits an oval, light-colored egg in the midst of a colony of aphis, from which the grub hatches and immediately proceeds to work. It will seize an aphis and lift it clear off the shoot, and after extracting the juice will drop the skin, and in a short time will entirely rid the trees of aphis.

"*Woolly Aphis*" (*Schizoneura lanigera*, Hansen).—This is one of the most troublesome insects that infest apple trees, both from its great fecundity and its ability to exist and propagate under ground, secure from the attacks of predaceous insects. This pest can readily be detected by the woolly secretions from their bodies, and also from the knotty and warty appearance of infested shoots. When young trees are infested, they can be kept comparatively free by brushing kerosene over the infested parts, or equal parts of turpentine and water applied in the same manner. Mix well while using. When the roots of the trees are infested there is no remedy so efficacious and inexpensive as gas-lime spread on the surface of the ground around the tree as far as the branches extend. Use one to two shovelfuls, according to size of tree. As this substance is of a caustic nature, great care must be taken not to allow it to come in contact with the trunk. To prevent the aphids from ascending or descending, remove the soil from the collar of the tree, and place therein some wood ashes or air-slacked lime. The various Coccinellidæ and their larvæ, also the larvæ of the lace-winged fly, assist very materially in the fight against this pest.

While upon the subject, I would like to call particular attention to the danger of introducing other species upon trees from other States and countries. Make a thorough and careful examination of all trees and plants that have recently been imported. If you have a County Board of Horticultural Commissioners invite them to assist you, as from their knowledge of the insect pests in their districts, they will be better able to detect any new insect upon the plants. This is a question there should be no effort to evade, for the sooner the owner is aware of the existence of any injurious insect upon his place, the less expensive will be its extermination, and the prosperity of the district will not be menaced. I would also state that my object in speaking of the various predaceous and parasitic insects, is not to discourage spraying or fumigation, but to call attention to and encourage a study of this very interesting branch of entomology.

CHEMICAL FUMIGATION.

By H. K. SNOW, of Tustin.

I have not the time to write any extended remarks on fumigation by the use of hydrocyanic gas treatment, but as I feel deeply interested in citrus culture, and having used this gas for several months, I feel it my duty to report, according to request.

I made my tents and commenced treating my orchard February 15th of this year (1890). I made two large tents thirty feet high and twenty feet in diameter, and two others which are twenty-two feet high and seventeen feet in diameter, out of two-ounce blue denim. I sized them first and then painted them, using lead, oil, lamp black, and spirits of turpentine, which makes them perfectly dark and tight.

My first work was done on my lemon orchard, by using on trees from twelve to fourteen feet high and twelve feet in diameter about four ounces of cyanide of potassium and four measured ounces of sulphuric acid turned into eight ounces of water, and I let the tents remain over the trees for fifteen minutes, but as the work progressed I found that the time was not long enough, and that the gas was not as strong as it ought

to be, so now we use about one fourth more material and let it remain under the tents twenty-five minutes, and for trees twenty feet high thirty minutes.

The work is very simple, and any one with ordinary intelligence can use it after seeing it done. The first thing we do to prepare to fumigate a tree twelve feet high and ten feet in diameter, is to take an earthen vessel that will hold six or eight quarts and set it directly under the tree with, say, eight ounces of water; we then weigh out four ounces of sulphuric acid, and put that into an earthen mug or pitcher, and set it alongside of the vessel with the water under the tree. We then place our tent over the tree, and one man lifts up one side of the tent and another crawls under and empties the acid and cyanide into the vessel containing the water, and puts a tin pan with cleats nailed inside over the vessel, so that it will turn the gas downwards and not spatter on the tents. He then crawls out, and the tent is let down; then see that the folds of the tent on the ground are well covered with soil, to prevent the escape of the gas, and in twenty-five minutes the tree is fumigated. I will say right here that there is not one scale left alive, where there is one hundred on the best sprayed tree ever done. I cannot say that it kills every bug when done in the best way, for there will once in awhile one escape for some reason unknown at present, but I think it is the only solution of the raising of marketable citrus fruits where the red scale (*A. aurantii*) has a foothold. Spraying with the best washes known so far will not do it, and, therefore, too much honor cannot be given to Professor Coquillett and Alexander Craw for discovering the gas treatment, and Messrs. Bishop, Wall, and Jones for putting it into practical use, by persistently working with it until they proved that it could only be done successfully in the night-time, the rays of the sun having such an effect upon the gas as to burn the foliage.

To show the difference between fumigating trees and spraying, I will state that I went into an orchard treated with gas, and picked an orange each from seven different trees that were covered with red scale, and in coming home I passed an orchard which had been sprayed with the rosin wash about two weeks, so I picked off an orange, and thought it was a good job. When I got home I took my glass to examine it, and found several young red scale; I then took a pin, and in a few moments killed seventy young scales crawling on that one orange. I then took from my pockets the seven oranges taken from seven different fumigated trees, and could not find a *live* scale on them.

Fumigation by hydrocyanic gas is the greatest boon ever discovered for the orange grower. It kills the black and brown scales as well as the red scale, and I have no doubt but that it will kill the San José scale also. The cost is not over one fourth to one half more than for spraying. In fumigation there is no missing a limb, nor half spraying the top; no chance to be careless or slovenly; every part of the tree from top to bottom is completely enveloped in gas, and if good judgment be used in the amount of ingredients, it may be depended on that not many scales will be left to damage your trees.

In making the tents I would recommend that the diameter be nearly as large as the height. You can place the tent over the tree easier and quicker, and with less injury to limbs and fruit. The tent folds together so completely that it can be adjusted to a small tree without waste of gas.

PRESENTATION TO ALBERT KOEBELE,

Discoverer of the *Vedalia cardinalis*.

PRESIDENT COOPER: I regret very much to announce that Hon. Frank McCoppin, of San Francisco, our late Commissioner to Melbourne, is not present. He has been unavoidably detained.

MR. COOPER then continued as follows: I have been requested to make a presentation at this Convention; the occasion and subject being considered of sufficient importance to have the ceremony recorded, and have it appear in our horticultural literature. In the month of August, 1888, Mr. Albert Koebele was sent to Australia for the purpose of searching for and procuring a parasitic insect to destroy the *Icerya purchasi*, commonly called the white scale, or in the hope, at least, that one might be discovered that would counteract the ravages of this terrible pest. The result of that voyage is too well known to most of our fruit growers for me to enter into details of what has since taken place. Those who may not be acquainted with the history, I refer to the Biennial Report of the State Board of Horticulture of 1885-86, pages 379 and 380-397; the Annual Report of 1889, pages 207-208, 266-271, and 385; and the Report of 1890, pages 53-58.

It may be well for me, however, to speak briefly of the actors that have brought about such wonderful results. The Australian beetle (*Vedalia cardinalis*) was classified and named many years ago by Mulsant. The function of this beetle was discovered by Albert Koebele. While it was known in Australia that some parasite was destroying the white scale, its disappearance was attributed to an entirely different insect, so that to Albert Koebele alone is due the honor of discovery. His name will live in this connection as long as our civilization exists.

Let us consider that although for more than ten years our most experienced, most intelligent, and most determined citrus growers were fighting the white scale, and communities were quarantining against it, it was gradually increasing and spreading, so that devastation appeared certain, all our efforts baffled, our hopes giving way to despair, and ourselves ready to bow to the inevitable and admit that we were powerless in the hands of this insect, when a few of these little ladybirds placed in our orchards, with their marvelous work, silent and unseen, in a few short months completed the extermination. Do we realize it? Can we realize it? Can we comprehend the wisdom of such a provision in nature? Has this lesson been seriously impressed upon our minds? A short period since this pest engaged the attention of fruit growers more than any other one thing. To-day we have forgotten it, and not a thought is given to what was the most alarming enemy of the fruit grower. Will we profit by this experience? If so, we will have without delay competent agents searching for parasites to destroy all the insect pests that disturb our fruit and fruit trees.

I was much impressed by an article written by Burnet Landreth, President of Pennsylvania Forestry Association, published in the "Garden and Forest," December, 1888, pages 500 and 501. The substance of this article is pertinent to the subject I am considering. Mr. Landreth was a member of a firm owning five thousand acres in eastern Virginia, on the lower Chesapeake. About two thirds of this land was covered with the original and second-growth pine, some hard-wood interspersed.

Amongst the native deciduous trees were found chestnut, walnut, ash, oak, and others. These gentlemen concluded to try forest planting on this tract. In 1870 and 1871, one hundred acres were planted with black walnuts, and eight acres with chestnuts. In 1872 to 1879 they planted 150 bushels black walnuts, 34 bushels chestnuts, 4 bushels black locusts with 105,000 seedling trees, 5,000 Southern cypress, 5,010 European larch with $1\frac{1}{2}$ bushels seeds, 10 bushels hickory nuts, 3 bushels tulip poplar, 3 bushels pecans, 10,000 ailantus, 16,000 white ash, 1 bushel white oak acorns, 17,000 catalpas, and 10 bushels seeds. Besides the above some White pine, Douglas spruce, and Douglas fir were planted.

The Report.—"Some of the black locusts were twelve feet high. They gave promise of a fine locust forest. One September the locust tree borer descended in swarms, laying millions of eggs, which produced myriads of grubs, and by the next midsummer every tree was ruined. We cut them down and pulled out the roots at an expense of \$25 per acre. The European larch gave out in the trunk, the main stem breaking off at about twelve feet. The Southern cypress next failed. The hickory and pecan nuts were to a large extent stolen by the squirrels, woodchucks, and field mice. Those that did grow were plowed out, and the ground replanted with catalpas. The tulip poplar was not a success, as the rabbits and field mice during winter ate off from the tender seedlings the sweet, juicy bark, and destroyed nearly every plant. The white oak acorns were largely stolen by animals, which also ate the bark of the young seedlings. In short, with us black locusts, deciduous cypress, European larch, hickory, pecan, tulip poplar, white oak, osage orange, wild black cherry, ailantus, white ash, mulberry, and some others have all failed. Of the catalpa we have abandoned several tracts, and after most serious ravages by stray cows, half-wild pigs, rabbits, squirrels, mice, and fire, have about two hundred thousand trees left. Two years ago every tree was denuded of its leaves, within a period of a month, by the ravages of the catalpa sphinx."

This certainly is a very discouraging record, and is a matter for serious reflection. When nature plants a forest she makes no mistakes. She plants the right trees in the right place. In the forests she plants flowers, annuals, bulbous roots, flowering shrubs, and vines. All flourish in their beauty and grandeur. No enemies, insect or animal, materially disturb it—at least until invaded by man. If we wish to succeed, we must follow nature. We have in the above an example where capital sought investment, the ultimate object being increase.

On the other hand we find capital going into our mountain regions, covered with dense forests, in localities unsuited for farms or homes, and with mills and machinery the owners cut down the forests and reduce them into merchantable lumber, devastating whole regions merely that the investment may be largely increased, and have no care for the consequences. We permit it. Evidence proves that intelligent races which once flourished are now extinct, having disappeared from the face of the earth. Historians tell us that they were overrun by barbarians. I dissent from that opinion. It was wrong doing, wrong living. They destroyed themselves. Do you believe that any portion of the earth's surface before it was invaded by man was ever devastated by floods or droughts? I do not. These things come by man's destroying the equilibriums. All things were created for our use, our develop-

ment, but we must make proper use of them. We witness from year to year great climatic changes from the former condition of even a hundred years ago: unprecedented storms, tornadoes, floods, and droughts. In society are even more formidable destructive elements: monopolies, syndicates, and trusts, accumulated capital with its power tampering with the very vitals of our republic.

The pests are among us, and if we do not live rightly our destruction will surely come.

Mr. Koebele, it gives me great pleasure to present you with this token of appreciation, on the part of the State Board of Horticulture and the donors, of your services in the discovery of the Australian ladybird. It is more than probable that you will be invited to make other voyages in search of parasitic insects. Your vocation, your profession, and your experience fit you especially to do this work. That your life and health may be preserved, and that whatever mission you are called upon to undertake may be as fruitful as your mission to Australia, is the earnest prayer of the fruit growers.

Concluding, President Cooper presented to Mr. Koebele a gold watch, chain, and charm, and to Mrs. Koebele a pair of diamond earrings. The watch bears the following inscription:

Presented by the State Board of Horticulture to ALBERT KOEBELE, the discoverer of the <i>Vedalia cardinalis</i> , on behalf of the Fruit Growers of California.

President Cooper then introduced Mr. Koebele to the Convention.

MR. KOEBELE: I am very grateful to the fruit growers for this acknowledgment, and I only hope that I shall have the pleasure of again serving them.

MR. COOPER: I will state that the resolutions that were passed at the Convention in Los Angeles have been engrossed, also those addressed to the Hon. Frank McCoppin, who, I am sorry to say, is not here this morning. These presents were purchased by the two committees that were appointed for that purpose, and the balance of the money, after the purchases were made, I will also hand to Mr. Koebele. A record of the names of the donors, and all the facts connected therewith, will appear in the next annual report.

DISCUSSION ON INSECT PESTS.

MRS. McCANN, of Santa Cruz: The cherry tree produces an insect, a little black slug, that eats off all the upper coating of the leaves of the cherry, leaving them as if they had been skeletonized, and every season for two or three years I have noticed this slug upon the cherry trees. I would be very glad if somebody would tell me of some remedy for this slug. It appears as a black, oozy snail, a little over half an inch long, resembling a small tadpole. I find it also upon the pear trees, sometimes in great numbers.

MR. BUCK: This slug is quite common, although with us in Vacaville we seldom get it on cherry trees, but very much on pear trees. The thing that cures them most effectually is to have the thermometer go up to about 110 degrees, and I will guarantee you will have no slugs the

next day. Almost anything will kill them. Any kind of a wash, any simple wash, whale-oil soap reduced, anything almost that touches the slug will kill him. And, further, it is necessary that it be killed, because its presence this year will make it almost impossible for you to get a crop of fruit the next year.. That is my experience.

MR. BERWICK: Slacked lime is very effectual, and an easy way of applying the slacked lime is to have an old barley sack and a pole sixteen or eighteen feet long, and put half a pound of dust or lime in the barley bag, and shake it over the tree in the morning when the dew is on the trees, and that will kill the slugs. And I want to say also with the mildew on the apple tree, a very handy way of applying the sulphur is by the same method; it is better than the bellows. It is quicker, and it does its work more effectually.

MR. BUCK: The first time I knew what this slug was I found it on some pear trees in large numbers, and I was very anxious to find out what to do. A man told me to throw dust on them, but fortunately we had one of those zephyrs from the north that raise the thermometer sometimes to 110 degrees before I got a chance to go to work at the slug, and when I went to hunt for him I couldn't find him. With us almost anything will kill them, but I presume it is largely owing to the dry, hot climate of that valley, and I presume that on the coast it would require different and probably harsher treatment.

MR. BLOCK: That insect is generally known as the pear slug. Now, if the pear tree is sprayed at the proper time, as it should be, for the purpose of destroying the codlin moth, *i. e.*, shortly after the tree gets out of bloom, with Paris green or London purple, it will destroy this slug, and the saw fly as well is destroyed with it. You can destroy the three different insects effectually with the same wash at the same time. I have never been troubled with either the saw fly or the pear slug wherever I have sprayed for the codlin moth at the proper time with Paris green. Now and then I have it on the cherry or plum, and it can be destroyed with either one of the remedies given—dust, or ashes, or lime.

DISCUSSION ON CHEMICAL FUMIGATION.

H. HAMILTON, of Orange: The expense upon a tree that contains one thousand cubic feet is about 25 cents, and larger trees in proportion. In Orange County there are ten companies of men fumigating, and they are doing the work at from 25 cents to \$1 per tree, according to the size. The work is all done in the night; it cannot be successfully done in the daytime, and for the last five months these companies have been at work every night steadily, and the work is still progressing. This kills all kinds of scale, but I want to say in reference to the black scale, that when the black scale is under a shell nothing will reach it—no wash in the world, no fumigation or anything else; you will have to take it when the scale is young, and the best time to fumigate for the black scale is in October and November. We use hydrocyanic acid gas, as given in the essay read this morning. On a tree that has one thousand cubic feet we use three ounces of cyanide of potassium, three ounces of sulphuric acid, and six ounces of water, and when we commenced this spring we allowed the tent to remain on the tree fifteen minutes, but we have found

that the work was not complete on the tree universally, and so extended the time to thirty minutes, and have since increased the amount about, as the paper says, 25 per cent, and some of them are increasing it a little more.

QUESTION: The next year does the scale remain?

MR. HAMILTON: We have only had the experience of one year with it. I want to say so far as the scale returning that there is no process found yet that will work uniformly on an old tree. I speak now with reference to the orange tree. All those who are engaged in orange culture know that the orange tree has regular periods for growth, and owing to the different conditions of trees uniformity cannot be had in fumigation and spraying. There will always be some tree that will not be disinfected by anything, and so it is necessary to repeat the process.

Q. Does it destroy the red scale entirely?

MR. HAMILTON: I am just saying that no process will make a complete job on a row of trees; it cannot be done. But the success during the past six months in Orange and Los Angeles Counties has been such that the orange trees have never looked so well before; the growth has been remarkable; the fruit is comparatively clean, and the amount of fruit has gradually increased, so that the estimate of fruit in the counties producing oranges this season is three thousand carloads. The amount of income from the crop this season is estimated at \$2,600,000. The other fruit crops in Southern California have increased this year in the same proportion, and a good many orchards that I know of report \$500 an acre profit on their apricots, and prunes in the same ratio. Prune trees have always produced an enormous crop, and Southern California is enjoying this year a fruit boom, instead of a corner lot boom.

MR. WHITE: Please tell us what effect your fumigation has on the eggs of the insect?

MR. HAMILTON: The black scale eggs, while they are in the shell, cannot be reached by anything; you have to wait until they are hatched out, and that is in September. After that is the time to fumigate for the black scale, because they are all out from under the scale; the old scale has disappeared and the young ones are there with the shell not yet formed, so that they are easily killed—almost anything will kill them, and the fumigation does it. So far as the red scale is concerned, there are no eggs; the red scale brings forth its young alive, or nearly so—they are generally admitted to be that way. I have watched, under the microscope, this spring a good deal, and I find that the red scale, when it is first deposited, will remain some fifteen or twenty minutes in a yellow, semi-transparent sac, in the form of an egg, and in about fifteen or twenty minutes it begins to show its limbs, very clumsy limbs, protruding from its sides, and then it begins to move; it crawls around for a few hours hunting for a place to locate. It is exceedingly clumsy, and if knocked off on the ground that is the last of it; it never can get up again, and if the wind is blowing or a storm raging at the time, it cleans them off so far as the young are concerned. But it crawls around when it has a favorable opportunity, and its choicest place to locate is on the fruit, and the next place is on the tender twigs or leaves, and as soon as it is located it begins to suck the sap from the tree. The black scale does not kill the tree like the red scale, but there are several species of the genus *Aspidiotus* which will do the same thing—the pernicious

scale is one, and it operates on the deciduous trees the same as the red scale does on citrus trees. No man has yet reported having seen the male of the black scale or any other Lecanium; if any man has, I would like to have him report. But so far as the red scale is concerned there is always an abundance of males, and they are never more than one third the size of the female; that is, they don't develop more than that. They have very long wings, and as soon as they are out of their shell they are ready for the operations of life. The female has no wings, and how she gets from tree to tree is a problem. I have not any doubt in my mind but that she is assisted by the male, because he has wings sufficiently large to do all this work. The length of time the red scale is operating on the tree is the whole season through. In the spring there will be but very few of them, because the winter has killed quite a large portion of them; the rains are especially destructive to the red scale, and the winds also prevent them from increasing in the winter, and in the spring there are very few on the tree.

MR. WHITE: How about the white scale?

MR. HAMILTON: We have none in our county, and the problem of the white scale is already solved by the *Vedalia cardinalis*.

MR. STOREY: Would you think if a man sprayed for the black scale in September, October, or November, he would be troubled afterwards?

MR. HAMILTON: If he is fortunate and gets a good job, he will not have to spray again for two years.

MR. STOREY: Tell about the cost and expense.

MR. HAMILTON: It costs about \$300 for an outfit. The company handled four tents. The report of the State Board of Horticulture for 1890 gives the drawings of the outfit. I will say that two tents are put upon one wagon, with a mast and a crossbar on top, and at the end of the bar a tent is suspended; they have guy ropes, and it is lifted and shoved along from tree to tree. Three men will attend to four tents.

MR. STOREY: How would you operate with a tent on a steep hillside?

MR. HAMILTON: You would have to haul your wagon up the hill, so as not to run on the hillside. If the trees are not very large you can use hand tents, which have a gas pipe through the bottom rim to keep them spread, and three men will place one over the tree and do the fumigating, and then lift it off and go on with it. If the trees are small, especially on the hillside, they can do it in that way.

N. H. CLAFLIN, of Riverside: The expense of fumigation depends very much upon the management, the number of tents used, and the manner in which the work is done. I have reliable information from Dr. Dunn, who has been doing the work in San Bernardino County, to the extent of five to seven thousand trees, the oldest twelve years old, and the youngest four years of age, at a cost of from 7 cents for young trees to 20 cents for the old. But the way he manages to do the work at that price is by having at least three of the outfits for the tents, so that he can put them over the large trees from the derricks, and, in addition to that, having some of the hand tents that were spoken of by Mr. Hamilton, of Orange; and all trees ten feet in height, or less, the men put the hand tents over, and in that way they get along much faster. I think in the use of fumigation for the black scale on the olive tree, that after once getting prepared, and the men learning how to do the work economically, that the scale can be killed on the trees at an expense not to exceed 20 cents for large olive trees.

MR. COOPER: I wish to correct one statement in regard to the spraying of the olive trees. The black scale, in the coast counties from, probably, San Francisco to San Diego, near the coast, commence to hatch from the twentieth of June to the twentieth of July, and they continue to hatch up to the end of February, so that it is a very difficult matter to fix upon any special time to spray the trees or to treat them with gas; it would have to be done twice each season.

Adjourned till the following morning at 9 o'clock.

TRANSACTIONS OF THE THIRD DAY.

SANTA CRUZ, November 20, 1890.

President COOPER in the chair.

SELECTING, PREPARING, AND MARKETING FRUITS.

FRUIT SHIPMENTS OF 1890.

By Vice-President L. W. BUCK.

It is not necessary for me to tell you that California is a great fruit-growing State, and that the capacities of California are but little touched as yet. The thing for us to consider is the kind of fruit to be raised to the best advantage and where to raise it. We have within our borders every variety of climate and soil almost that is found in the United States, from extremely poor to some of the finest. We have a great variety of climate, and the conditions of the soil and the conditions of the climate affect very largely the growth and maturity of the fruit that we may plant or attempt to raise on that soil.

We have as a market for our fruit three very important lines—the canning industry, drying, and Eastern shipping. The canning industry of this State is a large one, and is represented by able men, by good financiers, by gentlemen who are going to post themselves as to the probable supply and demand before the season opens, and they are in a position to understand that better than the average grower. The drying industry is a very large one, and it is in its infancy. It is but a few years ago that there was but little (of what there is now much) first class dried fruits put upon the market in this State. You go back; five or six years ago there was very little sorting; a man dried his good fruit and put it in the same sack as his refuse, but that has got to be changed, for the quality of dried fruit is going to figure as largely in the price realized as any other condition.

The Eastern shipment of fruit has been largely increased within the last five years. Six years ago we had a large crop of fruit, and but a very limited market. The buyers in the market, whether from a canner's standpoint or from a shipper's standpoint, only touched the fruit lightly, took that which they wanted, and left the balance in the hands of the fruit growers, and that was the prime cause of the formation of the California Fruit Union, which was first organized in the fall of 1885, and commenced operations in 1886. I have been the manager of the California Fruit Union for the years that it has been in operation; our shipments have largely increased each year as a rule, and I believe have been much more satisfactory this year than ever before. One reason for it is that our fruit as a rule was good in California this year, and the crop of domestic fruits in the East was very light. We have had as an offset for that—and it has been a very serious one—very poor railroad serv-

ice; in fact, I believe I may safely say that the California Fruit Union has not shipped a single car in four months that has been delivered to its point of destination on the expedited or schedule time. Such has not been the case in years past; the number of cars that have failed to reach the destined point in about the expedited time has been small, whereas this year the cars that have arrived on time have been the exception. I believe that in the year 1889, out of twenty odd special trains that we dispatched from Sacramento—when I say “we” I mean the California Fruit Union; I do not refer to any other outside organization, because I do not know anything about their business—of these twenty odd trains in 1889, there was but one that was not delivered on time in Chicago and equivalent points. In the year 1890 out of about the same number of trains there were but three that were delivered on time; and had it not been that California fruit, in even moderately poor condition, sold for a good price in the East, this year, owing to the almost absolute scarcity of fruit in the East, it would have been one of the most disastrous years that we have ever had. I do not mean to imply by that the drying and canning industries, I am meaning the Eastern shipments; but the high price that canners were forced to pay for fruit here and the expected high price that dried fruit would bring, have made the receipts of the California fruit grower large this year, although the crop has been rather under the average. Some have said that they thought the crop was a small one this year. I do not agree with them. I believe that California raised more fruit this year than ever before. While there has been quite a loss of trees in many localities, I believe that the additional age and size of trees in bearing this year have fully made up for the loss and for the short crop in some localities.

Now, then, how to dispose in a profitable manner of this fruit is what interests every fruit grower in the State; and I believe that one of the things that is a move in the right direction, is the formation of local organizations of some kind. This enables a man to ship five, ten, or fifty boxes to points where he could not do it when he had to work alone; in fact, a dozen or twenty men in a locality, although they be small fruit growers, can do that which they could not do if working independently. And besides that, there are many advantages in local organizations. You can have a little fund for experiment; you can have a little fund to pay for information, and you can, with a little money, either by sending an accredited agent to the East, or to other localities in this State, ascertain what is done in other sections. The sections of the State that have shipped largely to the East are limited, and the number of growers that have shipped is limited, and I believe there are not many of them living in Santa Cruz County. We have a little settlement up here in the Santa Cruz Mountains that has for several years shipped quite a number of cars of grapes, and usually with good results. Santa Clara County is one of the largest fruit-growing counties of this State, but you can count on the fingers of your two hands those that have shipped very largely from that county. Sacramento County has shipped considerable. The mountain counties, especially Placer, have shipped largely, as has Solano. Solano County has probably shipped more than any county to Eastern markets.

Now, of the kinds of fruit to ship, I will say this: Almost any fruit except black grapes will ship to Eastern markets to good advantage, if not shipped too largely, and if they get them there at the right time.

Solano being one of the earliest localities in the State, the early shipments from there have always been remunerative. The apricot has not been shipped largely, from the fact that the people of the East have not been educated to the eating of the apricot, and further, the apricot does not, like many other kinds of fruit, improve by being picked green and ripened en route. The shipments of apricots have been largely increased and the market extended, and markets that two or three years ago would take apricots sparingly have this year taken quite liberal supplies at fair prices.

I ought to have spoken of the cherry, that being the first. The cherry shipments have been very largely made from Alameda and Santa Clara Counties, the first going from Solano and Placer; but the prices that they usually bring, at the time that the cherries ripen in those localities, hardly justify large shipments. I think this year the Union shipped three or four cars from Solano and Placer Counties before there were any shipments made from Santa Clara and Alameda Counties, and I think that there must have been in the neighborhood of fifteen carloads shipped from those two counties, some of them with disastrous results, others very fine. It requires considerable experience (and that is usually best gained by your own efforts) to put up such a delicate fruit as the cherry and ship it on a trip that takes one week or thereabouts to arrive at its point of destination. Some of the best ventures that have been made this year were made on cherries. There were two or three cars that made more money to the shipper than any other cars that were shipped by those parties, and at the same time that that was true, they had previously sent some that were disastrous and caused them very heavy losses.

The peach has always been a desirable fruit to ship, and has always made a ready sale in all the Eastern markets, except when coming in competition with a large and full supply of domestic peaches there. All of the early peaches that have been shipped from California the last five years have, as a rule, paid well. Some of the intermediate peaches have not done as well, coming in conflict with liberal supplies of domestic fruit. Extremely late peaches have usually sold well. In picking and packing the peach there is a great deal of judgment required. The fruit should be as well matured as possible and still be perfectly firm, for if too green it does not carry any better than if too ripe, and consequently arrives there in much poorer condition for eating than does the peach that is a little overripe, and of which there may be some in the box. I have seen several gentlemen that were in the East this year who expressed a great surprise that fruit, and especially peaches, brought the price that they did in the Eastern markets, considering the condition of arrival. They said that a box of peaches half rotten even sold for \$1 or \$1 50. The service that we have had and the delays have made much of our fruit arrive there in poor condition.

The pear in nearly all varieties is a safe shipper, and if shipped at the right time usually carries fairly well and arrives there in good condition. Of course the Bartlett pear is shipped from here during the extreme hot weather, and some of them are scalded in the car on arrival. Those, of course, are in bad condition.

Our grape shipments this year have been very heavy indeed, and have not met with as profitable sales as in some other years, from the reason that our crop was a very heavy one here and met an equally heavy one in the East; still, taking the magnitude of the shipments

and the delay that they suffered in transit, I think that we may safely say that the shipments paid fairly well.

DISCUSSION ON FRUIT SHIPMENTS.

QUESTION: How about the prune and the plum?

MR. BUCK: They paid in the early part of the season extremely well. In fact, all California plums, ever since I have had the management of the California Fruit Union, have paid, I think, as well as anything that has been shipped, and especially is that true of the colored varieties; white varieties are not wanted except in very limited quantities. Two years ago I was East during the fruit season, and I understand that that is more than true now; from what I say it will be seen that California fruit is not only a luxury, but a necessity. The fruit dealers there require the California fruit to dress up their stands and make them attractive, and it is there shown that fruit should be of fine size and high color, and that is one of the things that makes its value there. It is sold almost entirely upon appearance.

MR. BERWICK: Will you state the most desirable kind of each fruit for Eastern shipments?

MR. BUCK: I think of the apricot, that the Royal is the best. The cherry, of course you commence with the early varieties, and if they carry well they are worth more than the better varieties that come later, and that is true of all kinds of fruits. The Black Tartarian, Royal Ann, Napoleon Bigarreau, and Black Republican are the main varieties shipped.

MR. ADAMS: You speak of some shipments of cherries being disastrous and some profitable. To what do you attribute this—the packing?

MR. BUCK: No; the same party packed them; but we had a rain about the first of May, and I think the shipments made immediately after that rain were disastrous.

MR. ADAMS: Then that must have been the packing, because they sent fruit made unfit for shipment by rain.

MR. BUCK: A great many times it is impossible to discern whether fruit will ship or not until it has been picked two or three days. That is the case often with grapes. Grapes may be burned so they are absolutely worthless, and if packed during the hot spell or immediately after, before they have had time to wither, you can hardly tell that they were spoiled for packing.

MR. BERWICK: Will you inform us as to varieties?

MR. BUCK: Of peaches, the Crawfords are the best, early and late. Commencing with the early varieties, the Alexander I is probably one of the best, and Hale's Early, Early Crawford, and Late Crawford.

Q. Early Beatrice—how is that?

MR. BUCK: I would not plant any of them. Following on is the Susquehanna, Orange and Lemon Clings, George's Late, and Salway are the principal varieties that are shipped.

MR. MOSHER: I would like to ask if Mary's Choice peach is a good shipper?

MR. BUCK: It is a good shipper. There are several varieties of peaches that are not very commonly raised, among them Mary's Choice, which

is a good shipping peach. It is very similar to the Crawford, of the Crawford family, and all of the Crawford family seem to be better keepers than most any peach raised. Reeve's Favorite is another one of about the same character, high colored and good flavored.

MR. THOMAS: How is it with Seller's Freestone?

MR. BUCK: I do not know the peach. Seller's Orange Cling is a good one; but a white peach, as a rule, is not a good shipping peach to any market. A high-colored yellow peach will sell much more readily than a white peach.

Q. How about the Foster?

MR. BUCK: The Foster is not as good a shipping peach as the Crawford. It is a good peach to raise for drying or canning purposes, but I do not consider it as good for shipping as the Crawford.

Q. I would like to inquire if it is necessary to have a great quantity of one variety in order to ship?

MR. BUCK: The greater variety you can have in a car the better it sells, as a rule. That is the object of different parties in a community loading a car.

MR. MOSHER: Are there many Muir peaches shipped?

MR. BUCK: Very few shipped, because they are a desirable canning peach, and canners have pretty much used them up, and I do not believe that the Muir would be as good to ship as some others, for the reason that it lacks color on the outside more than some other peaches do.

MR. BERWICK: Figs—what about them for shipment?

MR. BUCK: I would eat them here, because you would probably have your boxes and not many figs when they got there. Of grapes, some of the best sales that have been made were of the Early Chasselas variety; but it is only in limited quantities and from the earliest sections of the State that it would be advisable to ship the Chasselas; then come the Muscat and Tokay, which are the principal ones. The Emperor is a good shipper and good selling grape after the others are partly gone. The Emperor will not sell when brought in competition with the Muscat and Tokay.

MR. BERWICK: The pear?

MR. BUCK: Well, almost any pear, still the Bartlett is the principal one; then Beurré Hardy, Beurré Clairgeau, and Doyenne du Comice.

MR. BERWICK: What is the prospect for apples this year?

MR. BUCK: They are reported to be very light in the East; in fact, I know they must be, because I see by the quotations that they were selling for from \$4 50 to \$5 50 a barrel in New York only a few days ago, which is an extremely high price.

Q. How about the nectarine?

MR. BUCK: Well, a few high-colored nectarines sell high, but the nectarine as a rule is a delicate fruit, and the white varieties very seldom arrive there in good condition.

Q. As to the plum or prune?

MR. BUCK: Well, any of the early high-colored plums sell well.

Q. The Tragedy?

MR. BUCK: The Tragedy sells very high in the East.

Q. The Tuscan Cling peach—is that good?

MR. BUCK: I should rather can than ship them. To look at the Tuscan Cling you would judge that it ought to be a good shipper. The

shipments that have been made of it as a rule arrived poorly or sold poorly.

Q. How about the Verdal grape?

MR. BUCK: Well, the Verdal is something like the Emperor, it sells all right when there is not any other grape, but the Verdal is not a high-flavored grape. While it is a nice looking grape, it has not sold as well this fall as other grapes that have been shipped at the same time.

MR. STOREY: They say the bunches break off; how does that affect the product?

MR. BUCK: If a grape breaks loose from the stem in transit it is almost sure to decay; any variety of grape that breaks from the stem by handling or shipping arrives in the East in a bad condition.

Q. What has been your experience with the Japan plum?

MR. BUCK: It has generally sold for about from half to two thirds the price of good colored plums at the same time.

Q. Are Royal Hative plums good for shipment?

MR. BUCK: Yes, sir.

Q. How about the Columbia?

MR. BUCK: The Columbia is a good plum and sells well.

Q. How about the Silver prune?

MR. BUCK: A few Silver prunes will sell well, but if there are very many over there they will not sell. The same thing is true of all white plums; a few packages in a car will sell for more than the colored plums, but you put in a carload of white plums and a carload of colored plums at the same time in any market, and the colored plums will outsell the white 50 per cent certainly, if not 100 per cent.

Q. How about the Japanese persimmon?

MR. BUCK: There is a gentleman here who can give you absolute experience. Mr. Cooper has already shipped or started two carloads East this year. Those that he shipped in the past I know but little about.

MRS. McCANN: Has any one tried the Marianna plum?

MR. BUCK: I do not know it.

MRS. McCANN: It is a new one, for which they claim very great shipping qualities and an immense bearer. It is a new plum advertised by the Eastern growers as being very early and a very dark plum.

Q. What has been your experience in raising early vegetables and shipping them to the Eastern market?

MR. BUCK: There has been next to none from this part of the State. They get them from the Southern States as early or earlier than we do. None were shipped to the East from Vacaville to my knowledge.

Q. What would be the demand for early tomatoes in the Eastern markets?

MR. BUCK: They get them from the Southern States earlier than they can get them from here. If you get them early enough the demand will be good. The first come from the Bermuda Islands, followed by shipments from the Southern States.

Q. What is the difference between fruit that is thoroughly watered in the summer time and that which depends altogether upon cultivation?

MR. BUCK: The non-irrigated fruit has always shipped far better than the irrigated fruit.

MR. THOMAS: For the last three years I have been experimenting with the apricot plum (*Prunus simoni*). This year I have found it is good for three weeks' shipment. It is a fruit that will ripen in transit

and come out a beautiful red color, and I think it will be a fine fruit for shipping.

FRUIT PREPARATION.

By J. L. MOSHER, of San José.

The standard of our fruits as they are prepared for market is the important part of horticulture that first of all should not be neglected. We must not carry the idea that we have gained perfection; that there is only one way, and that we have all learned it, and that we have only to turn the handle and the work is done. The curing and preparation of fruits in this State is comparatively a new industry, and if we could look into the future, I believe we would all be very much surprised to see how much we have yet to learn. At the coming World's Fair nearly all nations will strive to excel in the preparation of their fruits, and California must not be lacking. France, with her ages of experience, will show us some excellent and astonishing productions. Florida and other States, although they seem to be quiet, will be there; but California, with her "go ahead" people, will not be satisfied unless we lead the world with the display of our fruits. The past season has forced upon us the knowledge that the curing and preparing of fruits is of as much, if not more importance, than the growing of them. I understand that there have been more than thirty carloads of prunes rejected by reason of improper preparation, and the bulk of these prunes, I understand, was from old, experienced driers. This goes to show that perfection has not been attained. I believe that in the next few years we will see many changes in the manipulation, and less expensive processes in the disposing of our fruits, and that we will have better processes, and thereby better fruits.

DISCUSSION ON FRUIT PREPARATION.

MR. ADAMS: I understand you to say that about thirty carloads of prunes were rejected. Can you tell us just exactly what was the matter with them?

MR. MOSHER: They were improperly cured. I think, as nearly as I could learn, that they were not exposed to the sun long enough—not dry enough; possibly some of them were slightly mildewed, caused by rain. I believe that the masses of the people are ignorant of the standard of some of our dried fruits; for instance, we take the peach, if we take the fully ripe peach properly prepared, when it is properly cooked it will be equal to, if not exceed, the ordinary grades of canned goods. Now, in this I do not wish to be understood as depreciating our canned goods, but endeavoring to lift up the standard of our dried fruit. We know it will take from seven to ten pounds, according to the kind of peaches, to make one of dried fruit, and as near as I can learn, that same amount would make about half a dozen cans of fruit, selling from 25 to possibly 30 cents a can, bringing in the neighborhood of \$1 50 or \$1 75. We do not consider that a high price, but if we get one fourth of that, if we get 40 cents for our best dried fruit, it is considered exorbitant.

MR. ROGERS: My method of curing prunes is similar to that commonly used in the Santa Clara Valley. Pick them when they are ripe, dip them in a solution of lye—it is pretty hard to give the strength. When I start with my fifty-gallon kettle, I put in five pounds of lye; and when it is not strong enough I put in another can—I keep them as near to that as I can. I rinse them in cold water—I am very careful that they are clean—and put them on trays. I grade them before I put them up. I leave them in the sun until I think they are dry enough to come in; then bring them in and throw them on the floor in the fruit house. I do not mean to pile them very deep, for I do not believe it is a good plan, but sometimes I have to. Sometimes those at the bottom, if they are not exactly cured, are liable to spoil. I leave them there until I am ready to pack them and ship them away. If I put them in boxes I dip them again, for possibly some moths have laid eggs on them, and they are liable to be wormy if I do not dip them again. Hot water is a good dip; put a little salt in it. Some use glycerine and some glucose.

QUESTION: How much glycerine?

MR. ROGERS: That is a question of choice—some a pound to fifty gallons, some two pounds. I suppose it will stand four pounds without tasting it. I never used as strong a solution as that; I have been told it is used. After you have dipped a great quantity of prunes you have a prune syrup in your dipper that gives the prunes a nice appearance; tends to give them this French appearance.

Q. How long do your prunes sweat?

MR. ROGERS: Until I get ready to pack them; sometimes two weeks, sometimes two months; they are always in condition. I have never been in a hurry to pack; I wait until I get through drying.

Q. Do you prefer packing them in boxes?

MR. ROGERS: I have packed but very little; this is the first year I have boxed any to amount to anything. I should judge that the finer varieties, that is, the larger ones, would pay best in boxes. I would not advise any one to pack small prunes in boxes.

Q. Have you had any trouble in some of the prunes not checking properly in the lye?

MR. ROGERS: Yes; you cannot overcome it; that is to say, there will be some of the prunes when you dip them into the lye that will show the cracks, and others won't show any effect; but, nevertheless, the lye has affected them.

Q. How do you tell when the prune is properly dried?

MR. ROGERS: I feel it. That only comes by experience. It is pretty hard to tell a man how they feel; if I had one here I could tell whether it was cured or not.

Q. Do they dry the prune until the stone comes out clean?

MR. ROGERS: I have never used that test; they say it is a very good one.

Q. When you pack prunes do you throw out those that are not dry enough?

MR. ROGERS: I have had to do that this year; pick out some very soft ones, those that did not seem to cut.

Q. How about the insects?

MR. ROGERS: As I say, the eggs are laid by the moths when they are on the trays, and after awhile the eggs hatch and the worm grows;

but if you leave them there a long while, where there is a good deal of pressure, they are not very liable to get wormy in the center of the pile.

MR. McLAUGHLIN: I had some in boxes and I stored them away for a month or two, and when I came to get them to ship, to send them to town, they were maggoty, and I never knew the cause of it, and I thought all prunes probably got maggoty when they were put away in a pile.

MR. ROGERS: If the gentleman had had them in one big pile they would not have got in that condition, but he had them in small boxes, and there was no pressure on them.

MR. MORRELL, of Wrights: I have had a good deal of experience in prune drying during the last fifteen years. My ranch is on the Santa Cruz Mountains; and I can't use a sled, so I shake them onto the ground, pick them up, grade them, dip them in a solution of lye, and put them on trays to dry. In my climate they dry in from five to ten days; I take them up, put them in bins and let them sweat, and afterwards dip them in boiling water with about five pounds of salt to fifty gallons of water, and then sack or box them.

MR. BERWICK: How long do they stay in the lye?

MR. MORRELL: From five to ten seconds. My kettle holds about ninety gallons, and I put in about six cans of lye to start with and add more as I fill it up with water. We have no method that I know of to test the quality of the lye.

MR. AIKEN: How do you tell when a prune is dry enough? Have you any test?

MR. MORRELL: When they will rattle on the boards is as good a test as I know of. The prune should not be picked from the tree at all; when ripe enough to leave the stem on the tree it is sufficiently ripe to dry; they will shake off easily from the stem.

Q. What brand of lye do you use?

MR. MORRELL: The best American concentrated lye.

MR. ROGERS: I will state that I have used this year the lye known as "Champion, 98 per cent." It is a powdered lye. With the American lye it don't seem to be all of the same strength. This Champion lye is excellent.

MR. ALLEN: This is one of the things that those who have had experience know they never can do by rule. As to the quantity of lye to use you must consider the state of ripeness, whether the trees have been irrigated or not, and other conditions. There must be always behind good fruit growing a trained eye and a cultivated mind, just as the fingers are practiced to tell whether the fruit is dry enough. You put your hand up to a bin of fruit, and your finger will detect every one that is not dry enough; if you have not the skilled finger, you have got to tell by observation. We do just as Mr. Morrell says: we put six or seven cans of lye into a ninety-gallon kettle; after you have dipped a ton in there is more or less sugar that has gone off of the fruit into your lye, and your lye begins to get ropy—it is sugary—it will not cut as well as it would before it had the saccharine matter in it; now you have got to put in a couple more cans, and when you put your dipper in and take your prunes out, your eye will tell you at a glance whether it is right or not; you have to learn it by experience. There are a great many things that come by brute strength and awkwardness; you have got to find it out by doing it. It is just the same with lye; nobody can give a rule. This

gentleman asked about cutting your fruit. If you grow good prunes, have them thrifty and well grown; they will all cut. If they have begun to wither a little, or your trees are drying up, they won't cut if you put in ten times as much lye; they are thick-skinned and puffed up; but if your land is well drained they will come out all right. You cannot give rules for all these things; you have got to get it in a general way, from trained observation that tells when you are right.

MR. MOSHER: First of all, it is very necessary to grade our fruit; that is one of the most important things to consider, unless it is the ripeness; we must get our prunes just as ripe as we possibly can. We begin, then, on a rich, black prune. As to the dipping, my experience is a little different from what has been mentioned here. I tried it in all shapes and ways, with all strengths of lye and without lye, and I find that the cutting depends more on the heat of your water. This season I thought I would dip my prunes in water or lye, heated by a stove, but I could not get the desired result that way. Now I heat my lye with steam, and get it very hot. I can take hot water and cut prunes, but I consider the lye an advantage, because it reduces the thickness of the skin and also assists, probably, in cutting the fruit. Another way I have practiced and found very advantageous: Before my prunes are entirely dry I put them in bins—when probably two thirds dry—and allow them to heat, but not long enough to spoil. I shovel them over probably every day, or every other day, and they heat and close. Then I take them out and put them on trays very deep, putting on one tray about as much fruit as I would ordinarily put on six, and then put them out in the sun. They don't dry too fast nor get hard, but are very pliable. After they are dipped I put them in bins. I have an apparatus with a hanger overhead; I have my bins in a row, and dip one hundred and fifty pounds at a time. We run them right along, and by having an extra rope we tip them out. One man does the work where otherwise it would take six. When in these bins, I watch them very closely to see that they do not become overheated, and when they get very soft and pliable we turn them over; we let them sweat again and watch them probably two days before we shovel them back again. I have had them lie in the bins this summer six or seven weeks.

MR. ROGERS: I would like to ask Mr. Mosher if he dips his prunes in this lye solution when it is boiling?

MR. MOSHER: Yes, sir.

MR. ROGERS: You consider that the best way?

MR. MOSHER: Yes, sir. We put them down quickly and bring them right out; as soon as they come out you can see right away whether they are cut properly or not.

MR. ROGERS: Do you find that those prunes that are dipped in the boiling solution dry better and more evenly than when the solution is just under the boiling point, say 205 instead of 212 degrees?

MR. MOSHER: We are not so very particular about that. The solution is boiling, and when you put in one hundred and fifty pounds of prunes that will reduce the temperature a good deal.

MR. ROGERS: I find in dipping into boiling water that it scalds the prunes and they do not dry well.

MR. MOSHER: There is another point I think is excellent; that is, after I have dipped my prunes into lye I dip them into a tub of cold running water, and then dip them into another tub, and then I have

another large tub with a steam pipe, with water not very hot—that is, not boiling. After they go through these two waters I dip them into this hot water again and leave them there until I know they are pretty well heated; then I put them on the tray. We roll them on the tray just as hot as you can roll them with your hands. I claim that we can gain thereby probably one or perhaps two days in drying, otherwise if you put the prunes out on a tray, say at ten o'clock in the morning, it will be twelve or one o'clock before they warm up; but if you put them into hot water and put them out hot, they are already heated and go right on drying. I don't know but that it is preservative, too. In September we had quite a heavy rain, and I had a good many prunes out; some of my neighbors had some prunes out that got a little moldy, but I had but little trouble that way.

FRUITS IN THE EASTERN MARKET.

By C. H. ALLEN, of San José.

I accepted the position of Superintendent of "California on Wheels" chiefly in the interest of fruit growing. I wanted to know something of what our fruits were doing East, and I will briefly give you the result of some of my observations. I joined the exhibit train in northern Wisconsin, and at the various places we visited I got leave of absence and visited the fruit dealers in the locality, particularly those who were wholesale dealers, where the place was large enough, and inquired of them what fruit they were selling, where they got it, what prices they realized, what their criticisms were, if any, upon California fruits. I made it a point in each place to get as much detailed information as I could of that kind. This side of Chicago our fruit, in most of the places I visited, was well known, and the market price and the sale of the fruit seemed to be satisfactory, and, as Mr. Buck very tersely stated, the sale is immensely increasing—the world is very large; I came to that conclusion after going over there and seeing the amount of fruit that is wanted, and the demand that is coming on, and will continue to come, and I came back with no fear of overproduction. I had had some fears of overproduction, but I am satisfied now that there is no danger of that.

When I got east of Chicago I found it considerably different; our fruit is almost an unknown quantity to the consumer in intermediate places east of Chicago. We went down on the Baltimore and Ohio, stopping at all the little hamlets and towns of five, and twelve, and fifteen thousand, and very few there knew California fruit; I mean our dried fruit. They knew something of our green fruits. I would say that I found the green fruits on fruit-stands everywhere in all those little towns not of the best quality, but a vast amount of it sold, such as I had hardly expected. There were a dozen fruit-stands in every town covered with California fruit, but the dried fruit in most of them was almost an unknown quantity. They would come through the car, and look at our samples of dried fruit—no better than we have below here; no better dried fruit in the car than we are exhibiting here, and putting up all over the State—and would come back to me and say: "Where can we get that kind of fruit? We have never seen anything

of the kind." Not by ones, or twos, or scores even, but by the hundreds. "Why don't you people get your fruit out here." I found that all the way, say, after we left Pullman, east of Chicago. At every little place that was the cry all the way through, and until we got into Wheeling and Pittsburg, where I left the train. In Pittsburg, which I believe is the greatest dried fruit market in the world, from reasons that a gentleman gave me there; he said: "They are all mechanics; your dried fruit does not sell to bankers and merchants, and that class, because they can afford to buy your canned and fresh fruits. It does not sell to the farmer, because they raise a little fruit of their own, but here we are all mechanics, as a whole, from Wheeling clear through to Pittsburg, and live on dried fruit, and here is where your market is, and we are anxious to learn all that can be learned of your fruit, and to know where it can be had, and where we can get such qualities as you are exhibiting here."

I found, as I suppose one might expect to find, knowing the peculiarities of human nature, a good deal of fruit sold as California fruit that was never nearer California than Chicago. I found some exceedingly inferior fruit marked "California Dried Fruit." I went into one large and thriving city and went to a wholesale dealer, and in my ordinary way gave him my card and told him what I was doing—and I want to say that we were made very welcome everywhere; they didn't look upon us as drummers at all, but they wanted information; they were anxious to learn. I asked him: "What fruit are you selling from California?" He said: "We can't sell California fruit, it is poor stuff; I have got a hundred boxes upstairs, and they bring it back." I said: "May I ask permission to look at the fruit." "Yes," he said, and he went up with me to the loft, called his man in charge, and took down some boxes marked "California Spanish Prunes." I said: "That is an unknown term so far as I know; I know California pretty well, but I do not know any Spanish prunes; will you have your man open one of these boxes?" He opened the boxes, and they were, I should judge from appearance, dried Damson plums, all bone except a little skin drawn over them. I could not see that anybody would ever buy anything of that kind if they had tried it once. He had a hundred boxes of those prunes that had been sold to him for California fruit. I found that duplicated in a number of places where I looked at the fruit, and knew that it had never come from here.

MR. ADAMS: Is that distributed by any well known dealer in California fruits?

MR. ALLEN: It had a name on the outside of the box that I am familiar with.

MR. ADAMS: What was it? I think we are entitled to the information. Whose name was on the box?

MR. ALLEN: The man who bought it can give it to you. No, gentlemen, I should be sorry to believe that the brand on the outside of those boxes was put on by the men who deal in that fruit. I believe it was a forgery. I do not believe that Porter Brothers sold fruit that was never raised here and palmed it off for California fruit. I do not believe they did it, and yet their name was there, and I give it with that statement, because I know the gentlemen. I believe that the forgery occurred farther East than that. I believe there is where they are put up, and that the fruit is sold all the way through there in that way, spoiling our

trade, for anybody who would get one of those boxes would never want any more California fruit. It seems to me that there should be some way that we could secure a guarantee that our fruit is genuine, because such practices are largely injuring the trade not only in our dried fruit but in our green fruit. They have constantly sold there an Egg plum for the Silver prune. I found boxes packed by a drier and marked "Egg Prunes," and they were selling them as a sweet prune. I asked a gentleman: "How does the Silver prune sell?" He said: "It is so sour that no body wants it." I said: "The Silver prune is a sweet prune." He said: "Oh, no; it is the sourest thing you ever tasted." He had bought a large quantity of dried Egg plums which were sour enough to suit anybody, and bought them as Silver prunes, and supposed he was dealing in Silver prunes. That sort of thing is spoiling the demand for California fruit. They do not know what our fruit is, and if in some way we could remedy those things, get this fruit that is well prepared and is suitable for table, and could put it on the market and in some manner suppress the other, we could not do a better thing for our California fruit industry. Whether this organization can do anything of that kind I do not know, but I feel very much interested; I felt indignant that we were thus swindled, that we were having palmed off as our California fruit, fruit that was neither grown nor prepared here, and I could see that it was working an injury, so that for years there will be no demand for California fruit in such places.

MR. ADAMS: Do you think that that evil of adulteration or fraudulent practice is sufficiently extensive to call for any expression of opinion or any action from any horticultural body in this State, or is it merely a trifling matter which occurred in one or two instances?

MR. ALLEN: It was pretty widespread. I will give this as a suggestion, and perhaps a wiser man can work it out. It seems to me if there could be a little pamphlet prepared, giving an accurate description of the various brands, not personal brands now, but kinds of fruit; that the dried Prune d'Agen was so and so in appearance, tasted so and so; the Silver prune was so and so, and the Egg plum, and so on; a general description of our dried fruits, with or without cuts, and I do not think cuts would be necessary. If that could be generally distributed throughout the East it would help to mitigate the trouble. They seem to be exceedingly anxious, particularly the wholesale dealers there in Pittsburg, to get into closer connection with the grower. "We do not want to go through all this manipulation; why don't you have some organization there, so that we can buy from responsible organizations in your State, and buy direct, and not through the brokers and middlemen?" They say: "Of course we can't buy from individual growers, we don't know you." I returned the compliment and said: "We do not know you." "No," he said, "but you can go to 'Dunn's Commercial Register,' and you can find out all about us, and we can't find out anything about you. If we buy of you, we have no guarantee at all. If you can get any organization to give us any guarantee that we can buy direct your California fruit, you will get our trade." That is one point that may work.

MR. ADAMS: I would like to ask Mr. Allen if he thinks they scratch off the names on the boxes?

MR. ALLEN: I found boxes that obviously had every trace taken off that was put on by the grower; and nothing that we grow, nothing that

my friend Mr. Morrell grows, nothing of that kind that we have supposed was getting a little reputation there, had any name or any traces of any on. They do not know where they come from. All that I found east of Chicago had the name removed, and a new stamp put on. I had vainly hoped we would get a little reputation, but there was not anything of that. It was not so in Chicago; I attended the fruit sales in Chicago, and I found Mr. Buck's and Mr. Block's fruit sold green with their stamp on; but when we got east of there the dried fruit is not so sold—it is with the name of the broker.

MR. CLAFLIN: I wish to state on this subject, that the orange growers of Riverside have endeavored to solve this problem in this way, by organizing a fruit growers' association, adopting a trademark, having it registered, and having the trademark placed in such a way that when it is placed upon a package the package cannot be opened without disturbing the trademark. On that trademark is a statement of the place where the fruit is raised and packed, so that any person buying packages with that trademark on will have the guarantee that it is raised and packed there. With that trademark, which is established under the signature and authority of the Board of Trade, guaranteeing the reliability of the fruit which it covers, it seems to me that that might be done in any place.

MR. ADAMS: I believe from what Professor Allen has told me at other times, that it is one of the most important subjects that could engage the attention of the fruit growers here, and I am utterly opposed to bringing up these things and talking about them without trying to do something, and I move that a committee of three be appointed to consider this subject and report thereon.

Adopted.

COMMITTEE.

President Cooper appointed E. F. Adams, D. M. Locke, and Geo. Hussmann.

COMMITTEE ON EXHIBITS.

The following were appointed to examine the exhibits, and on resolutions: H. C. Dillon, of Long Beach; Fred. C. Miles, of Penryn; G. E. Mitchell, of Pomona; R. C. Kells, of Yuba City, and H. Hamilton, of Orange.

Recess was then taken till 2 o'clock P. M.

AFTERNOON SESSION.

President COOPER in the chair.

PRUNING.

By R. C. KELS, of Yuba City.

I am a thorough advocate of pruning. You can refer to some of our oldest growers in the State, Senator Buck, A. T. Hatch, W. W. Smith, General Bidwell, Thomas Garey, and others throughout the State, and you can get their ideas of pruning and yet not know how to prune until

you have had some practical experience. The subject has been taken up here, since this Convention has met, as to the style of pruning. I, for one, advocate low pruning. I had an essay on the subject of pruning at the Sacramento Convention in 1885, and I still hold to the same points I tried to explain at that time. Low pruning was considered by a great many as objectionable on account of cultivation. We have at the present time appliances so that we can cultivate by horse-power and get as close to our trees as we can with high pruning, and in fact I think we can get closer to the trees and do more thorough work with less injury to the trees than we can with high pruning. For instance, a man wants to prune his trees high; what he calls high pruning would be a five or six-foot body perhaps, or we will say four feet; when he tries to plow close to that tree, which he will endeavor to do, he is going to injure the limbs and tear the branches off a great deal worse than when he is plowing a tree that is well pruned and simply rub the outer branches or limbs, which will give way either to the harness or to the plow. A great point in favor of low pruning is that we thereby save a great expense in gathering our fruit, and we can balance our trees much easier by low pruning; we can shape them so that if they are inclined to lean too much one way we can cut off some of the lower branches and straighten the trees. The expense of gathering fruit with step-ladders from high-pruned trees is enormous; a man cannot gather one fourth as much fruit from a high ladder as he can from the ground. I have not any particular point that might be new to fruit growers that I think of to bring before this Convention. I simply mention these points so as to bring about a general discussion of the matter.

DISCUSSION ON PRUNING.

MR. COOPER: I would like to inquire what the gentleman (Mr. Kells) calls "low" pruning and "high" pruning?

MR. KELLS: Six years ago we set out an orchard of eighty acres; we cut our trees as they came from the nursery back to an average of twelve or fifteen inches in height, cutting close to a bud, so that we would not have too much of a dry snag left after the tree began to grow; that made the bodies not over a foot or fifteen inches in height, and the buds start at about that height. All young orchards that have been put out in our neighborhood since then have been pruned pretty much after that fashion. That is what we call low pruning in starting a tree. We believe in thorough pruning back the first two or three years, cutting back fully one half or two thirds of the first year's growth after planting, following the second year by cutting back to one third of the second year's growth. Mr. W. W. Smith has laid down plans for pruning at different times before this Convention, and has laid out in his manner of pruning a very careful system, but I do not think that there is any one who can follow any particular plan of that kind and make pruning successful by trying to keep his trees in uniform shape.

MR. COOPER: I would like to inquire of Mr. Kells what season of the year we should prune trees?

MR. KELLS: I will state that we begin pruning in the Sacramento Valley as soon as we can get at it after the leaves are off. We are pruning apricots now in our locality.

MR. ADAMS: I notice in the Santa Clara Valley they commence pruning as soon as they get the fruit out of the way, while the leaves are still on as thick as ever, and before they begin to turn at all. I will inquire whether the gentleman knows of any objection to that practice?

MR. KELLS: I do not, so far as I am concerned, except that it is a little more expensive. I think you cannot make as much speed in pruning when the leaves are on as you can when they are shed.

MR. HALL: In some sections they prune the trees in June, when they are growing. I would like to hear about that.

MR. KELLS: I would call that "summer" pruning. My experience in summer pruning is not very satisfactory. Our trees produce so many new laterals and branches that we think we are making too much of a broom-shaped concern to the tree—too many clusters coming together—so we do not think summer pruning is advantageous in our section.

MR. ADAMS: I was going to say this: A tree from either striking a poor stratum of soil, or some injury to the root, or from some cause, fails or has very little growth; now, for the purpose of starting and producing new wood, is there any objection to pruning back into the old wood?

MR. KELLS: None, except you lose your fruit crop if your trees are old enough to bear. If you cut off your old wood you cut off your fruit wood.

MR. ADAMS: What you cut off you lose, but what is left, perhaps, is as much as you desire the tree to bear. I want to know if there is any experience of any injury at all, except the loss of the fruit, where you actually cut off the old wood?

MR. KELLS: I should think that cutting back would be a benefit to some trees.

MR. HALL: I wish to ask the gentleman for information respecting the first pruning of the olive where it is raised from the limb-cutting. As at present advised, I am told to uncover the cutting and cut off all that part of the cutting, except where the root was formed, with a sharp saw, and then tie it up to a post, and so forth. I find that very difficult in operation, and that it disturbs the roots materially and impairs the growth of the tree. If there is any better way I would like to know it.

MR. STEWART: I think there can be no general rule laid down for pruning; a man has to study his tree and his soil and then do it. I know people come to me and say: "Why do you go in for this low pruning and then advocate high pruning?" I used to think that people who advocated high pruning were fools, but a little experience teaches me that they were not; in certain cases they were wise. For instance, prunes I would train low, a low head, eighteen inches to two feet; but if we are to take a walnut or a Newtown Pippin apple I never would think of such a thing. I cut my Bellflowers down that way; now they are in bearing, and what is the consequence? They bear, and this branch goes way down to the ground, then that branch goes down, and scarcely anything is left of my Bellflowers. I didn't understand altogether the question the gentleman wanted to ask.

MR. HALL: For instance, there is an olive cutting eighteen or twenty inches long placed in the ground at an angle of 45 degrees; it begins to sprout from near the upper end; after the root is formed what will you do with the rest of the cutting? I am advised to uncover and cut it off with a sharp saw, and then tie up the sprout to a thick post.

MR. STEWART: I think it would be just as safe to leave it. My prin-

cipal object in olive planting is, first of all, to get a good root above everything else; let all suckers grow the first year; afterwards, if the tree has grown well, prune it to one branch, cut off the top and let it form a head.

MR. BUCK: I would agree with Mr. Kells in nearly everything he has said. I consider low pruning advantageous, in our section decidedly so, and unless absolutely obliged to, on account of too heavy a growth in summer and breaking by wind in the fall on young prunes, I never would summer prune. I would hardly go as low as Mr. Kells said, though I would cut them about twenty inches from the ground, which I call low pruning. I think it is more advantageous; you get a better shaped tree, easier handled, and I believe just as easily worked. Now, in reference to the apple tree, I presume the gentleman is correct; that high pruning would be better for apples than low pruning; that the body should probably be higher; but for a peach, or an apricot, or a plum, or a prune, I believe that that is more satisfactory in our section, and I would prune the first and the second year so that I would not have the limbs bear down or come down to the ground. I would prune so that I would have a strong, heavy fork at the upper end of the body of the tree.

MR. ADAMS: How would you manage that with the Bartlett pear?

MR. BUCK: I would do the same thing with the Bartlett pear, running from the first year one set of shoots higher than the other. A Bartlett pear, of course, grows very straight for the first three or four years, and as they begin to bear they will come out; then after they are bearing to any extent you want to prune the other way; your limbs will come down to the ground after they commence to bear.

MR. ADAMS: Bartlett pears give me more trouble than anything else. I have hardly been able to prune them so that I would not have to cut them off when they begin to bear.

MR. BUCK: We have a great many Bartlett pears, and we prune them but little until they commence to bear, except cutting off the ends of the limbs; then when they commence to bear you have got to prune them up.

MR. ADAMS: I have one more question I would like to ask. So far as I am concerned, I think I know something about the care of trees and the pruning in their younger stages. My own trees are coming to an age where they are beginning to bear and stop that excessive growth. Of course one can go into an orchard and see points that need be removed in any tree; but as I look over my orchard this year, after the bearing of last year, on many of the thrifty, healthy trees I see no occasion to prune at all, except to remove here and there a limb. For any systematic pruning of the whole tree I see no reason, for the growth has not been so great that any fruit that comes upon it is liable to break it down. I wish to inquire whether it is the general practice to keep on with the systematic and regular pruning of the limbs, or whether there is a time when this systematic pruning stops?

MR. McWILLIAMS: I have had some thirty years' experience in pruning, and some time ago there were two expert pruners came to me and said: "We have got certificates from the best orchardists in the State as being professional pruners." I said: "Gentlemen, you are the very men I am not looking for." Later I asked another man if he had ever pruned, and he said: "I have never pruned a tree in my life." And I

said: "You are the man I am looking for." I have experimented a great deal in pruning trees, and I am tired of cutting off all the fruit, and throwing it into the brush pile and burning it. Last year I put out some ninety acres of peaches in Colusa County on rich, fertile soil. In my experience I have never seen a man so poor but what he could always give his rich neighbor ideas how to make money, and I never have seen a man that has ever raised a tree in this country but what he could give good advice in his own estimation as regards how to prune; but on account of our rich soil and our fine climate it will produce a tree, and he claims all the credit for his expert pruning. A man came to me two years ago and said: "You are not pruning your trees enough." I am decidedly in favor of low pruning, especially the peach, and furthermore, I am decidedly in favor of planting the dormant bud; if you want a beautiful peach orchard it will grow out uniformly, and produce trees armed by nature, if you will cultivate your trees in a proper manner. This gentleman came in and said: "Let us try this experiment; I want to cut this row back two thirds." I was cutting them about one fourth. We were right on a row in the center of the peach trees that were not cut at all, and now, sir, those trees that I had not cut at all, except pruning the awkward twisting limbs, are decidedly the finest row of trees I have got in my orchard. I find in my experience that we are pruning entirely too much, both the peach and the prune, and I have left nature to take her course to a great extent to prune those; thin more and prune less, and you will have a finer article of fruit.

MR. HUSSMANN: I believe the whole subject of pruning can be put in a nutshell by saying that the pruner, whatever tree he is to handle, must be a thinking and an observing man; prune a tree just according to its habit; for instance, if a man wants to go into an apple orchard and prune every variety alike, even to a certain height, he will find himself, as Dr. Stewart observes, very much embarrassed after a time. A man must use his judgment and know the variety he has to prune, and the kind of fruit he has to prune; you can come here and talk for hours and days together about pruning, and each one can give his experience, and go back not much wiser than he was before.

MRS. McCANN: Any one who has had much to do with trees has somewhat the experience of this gentleman. It is a very dangerous thing to let a professional pruner loose in your grounds, for the more wood they take off the bigger the job they have before them and the better delighted they seem to be, until I have concluded that I didn't want my trees professionally pruned, and looked for the man that didn't know a single thing about pruning, but to obey me; and then armed with a fishing pole I pointed to the place I wanted cut and said: "Saw there;" and around the tips of the trees, where it was thin, I found there would be three buds on a little limb, and if they were all turning that way I watched for the bud that turned this way, and if they were all going that way I trained a dozen buds the other way, cutting just a little above the outgoing bud so as to throw from the single stump a strong limb and balance my tree by nature's plan, and not by propping it up with a fence rail.

MR. CADWELL, of Healdsburg: I have had a good deal of experience in pruning; at first I pruned low on account of being near the coast, and having a good deal of wind I supposed it was necessary in order to

keep the trees in any shape. I have mostly apples, pears, and cherries, but apples I am speaking of more particularly. I used to cut my trees back, and the next year I would have some ten to twenty sprouts to cut off: I came to the conclusion that that was not right, and read every theory I could find until I became perfectly disgusted, and changed the thing around and thought I would try a few trees and let nature take her course. Many trees have died out of the orchard, and I put in young trees and let them grow until they got fully in bearing, probably three years; the second year they bear tolerably well, and the third year the branches bend down with fruit; any one with common sense could prune a tree after that; they will send up shoots that form a wide top and you have a fine tree. Let that tree go on as nature intended. I do not prune at all only the new branches, and to get my horse near the tree I cut it probably three feet high, and then if there is a branch that comes down in the way I cut it off to get under the tree. I have done that for the last twelve or thirteen years, and I have got trees that are over thirty feet high and fifteen feet across, eight or nine years old, and I do not calculate to prune them until it is really necessary, since nature can do a great deal more than I can, and I find it profitable to let nature take her course. I am speaking more particularly of apple and pear trees; my cherry trees get but very little pruning.

MR. JOHNSTON, of Courtland: This question of pruning is one so diversified that it is very difficult indeed for any one person to lay down a rule that can govern all sections and all circumstances. The different localities require different treatment of the trees, so that it is impossible for a State institution of this kind, representing all the people of this beautiful State, to come to any conclusion or establish any definite system for the people all over the State. This discussion has reminded me of a little story. There were five or six ladies who met together and they discussed the question of handling husbands, and they concluded to have an afternoon tea for the purpose of enlightening each other upon the question; so they met, and each one explained the manner in which she handled her husband, and it is needless to say that the experience of those ladies differed as widely as the experience of the gentlemen who have discussed the question of pruning this afternoon; for upon comparing notes they found that each one had a different husband to train. Now, these gentlemen who have so eloquently discussed the question of pruning are from different localities; they have different orchards, different varieties of fruit; some of them plant their trees fifteen or sixteen feet apart, and some of these gentlemen who claim to have these great big apple trees, have them probably forty feet apart; some of them are training peach trees in our hot valleys where they can only raise good peaches, and others are raising pears and apples in the mountains where they can only raise good apples. In order to understand this question you must visit the orchards in your particular locality; go to the successful orchardist in your neighborhood and pattern after him; don't come to the Horticultural Convention where members come from all over the State.

MR. CADWELL: Some remarks were made here in regard to the planting of young trees. Along the coast where I am I did not take the advice of the nurseryman, and I have kept getting older trees, and older trees, till I put out four-year old trees; and the large trees that I speak of were put out four years old in a barley field—just two or three

furrows plowed, and put in—and I have been the most successful that way of any—not wishing to say that I am the only man that is successful, but my nurseryman told me they would not grow at all. The next year I put out four-year old trees, cut them down to three feet, and put a graft in them, and the next year they bore; and I assure you they are as fine trees as you ever saw. But that is no reason why any one else should follow my example, because he might not be successful. However, I am satisfied that we do prune too much. Now, near Santa Rosa, if you take the same plan that they do at Vacaville, you will be like the man that I sold trees to in the early days, who wanted to know the reason why the trees didn't bear. He said that his neighbor's trees were bearing nicely, whom I had sold trees too. I said: "What is the matter?" and he said he didn't know—to come down and see. I went down, and told him that he had cut the fruit buds off—and there are many that do the same thing. There are men around Santa Rosa raising prunes that cut them just the same as they do in other localities, and the consequence is they get no fruit—only a tremendous growth of wood. I am satisfied that they cut too much, and get too much wood. Let nature have a show to form and mature the fruit, and they will bear.

J. M. BENSON, of Elliott: I agree with my friend Mr. McWilliams about dormant buds being as good a tree as you can plant, but they require a great deal of care and attention. A few years ago I planted dormant buds, and also June buds of the peach, and the dormant buds to-day show the best trees, but it is the result of care in growing the trees and keeping close watch, and having a rabbit-tight fence around them. The gentleman speaks of letting nature take her course. If he will visit San Joaquin County and go around that county he will see apricot and peach trees running rampant, and he will want to check them a little bit. I think this is a problem all must solve for themselves. Now, as to prune, almond, pear, and apple, I do not believe in too much cutting; I have some prunes three years old, and when I planted them out I headed them back to twenty inches. The bodies now are two feet high; they stretch, they say; and I got some June buds of the almond from Mr. Hatch (they are very fine trees), and all I intend to do is to cut off the branches in the way of the plow, thin out a little and let them grow. The prune I headed in last winter, and got more sprouts there than you ever saw, but the fittest will survive, and when they get to bearing I think they will stop growing; but as to the peach and apricot I think you have got to head them in, and severely, too; if you do not they will run up into unsightly poles and break down.

MR. BLOCK: I would like to ask when those second quality trees were set out, with the first quality one year old; were they both pruned alike, and how high were they cut from the ground? My experience is, that if you put in a two-year old tree and cut it a little more than you would a one-year old tree—cut them both pretty well, but see to it that the two-year old tree is cut lower—it will do very well. It is possible that insects get in, and also that the borer gets in afterwards. Now, Mr. President, in regard to pruning: You can adopt here no method that will apply to all trees or to all localities; such a thing is impossible. You take, for instance, as an illustration, the Early Crawford peach and the Late Crawford peach; to trim them in the same locality alike I think is a great mistake; and why? The Early Crawford peach makes its fruit

buds at the upper end of the limb; the Late Crawford peach will make its fruit buds from the very bottom up; consequently, if you trim them both alike you will find your mistake. The disposition of the Late Crawford peach is to run away out, and you are going to have a very high tree that will bend down. You can get an equal quantity of fruit from both of them by trimming one higher—the Early Crawford. You have got to see where the fruit buds are. I have seen many professional pruners who did not know the difference between a fruit bud and any other. They have started in to prune an Early Crawford peach and cut away all the fruit buds; or prune a Late Crawford and leave too many, cutting them both alike. A pruner must understand what a fruit bud is, and what is not, and prune accordingly. I believe a great deal in following nature; but you are not going far enough in connection with nature, that is, if you want to follow that practice; you have got to let the cows, the sheep, the deer, and everything else roam in your orchard, and they will assist you in pruning your trees properly. I believe nature has provided for it; that the trees that require pruning probably have leaves that are a little sweeter than the others, so that these animals may prune them better than one of our professional pruners. I had a good deal rather have them than nine tenths of the professional pruners that I know.

MR. CAMPBELL, of Santa Clara: I have eleven or twelve acres of Moorpark apricots; they are shy bearers, and have borne very light crops for two or three years; they seem to be healthy; they have been regularly pruned until within the last two years; no pruning done on them last year at all, but they have had only one good crop in eight years. I would like to get some information as to the reason of that. Another thing I want to ask about is, what are we going to do with the peach borer? It affects every tree that is on peach root.

MR. BUCK: The Moorpark apricot is a shy bearer in very many sections of the State, yet in other sections the Moorpark bears the best of any. I have a few Moorpark trees at Vacaville, and I think in fifteen or sixteen years there was but one crop of any account. One year I had a very heavy crop, and I do not think I ever had as much in all the other fourteen years as I did in that one; so that the Moorpark is almost an absolute failure in our locality. It bears better in Alameda and Santa Clara than in any other part of the State, I think.

MR. HUSSMANN: The peach borer enters just below the collar of the tree, and you see the sap oozing out; the only remedy that I know of is to cut it out, and put some ashes over the collar of the tree. It is very much more troublesome in the East than here, but it is very destructive in some parts of the State. As to the Moorpark apricot, if they were my trees I would graft them over to something better.

MR. McWILLIAMS: There are two kinds of peach borers that prey upon my trees, though neither one of them is a great disadvantage. There is one that we call the peach moth, that is not like the codlin moth; it eats a little around the stem of the peach, but does not penetrate to any depth. It is not the great terror we expected it would be. This borer does not confine its attacks particularly to the peach, but every kind or variety of wood where the sap ceases to flow. I have seen the worm that produces what is called the "stag" beetle, the largest beetle known, and then it comes down to this worm spoken of. Now, whenever a tree is planted out, if you notice a little bug that is not over half an inch

long, it lays its eggs in the shell of the bark of the tree, and then when it hatches out it commences its work, and whenever it comes in contact with the sap that is freely flowing it stops; but if the tree is a little sunburned on that side it will continue on that side and travel up and down, and finally make its winter quarters in the center of the tree; then he has done his work, and you need not be afraid of him any longer. You need not cut him out, because he will come out in the spring of the year a full-fledged beetle, and then he is ready for business. In order to prevent that, if you will take the same kind of wax you used in grafting the tree and put a little on the sunny side, or cultivate the trees well and keep the sap flowing, you need not be afraid of this borer.

MR. CADWELL: The reason of that is the burning of the tree by the sun. It is all in the bark; whenever the bark sours you can find them in the tree.

MR. ADAMS: Let me ask whether a good coat of whitewash would not be effective?

MR. CADWELL: I have never found it so much so as a little shade of some kind, either a shingle or something of that kind, to keep the sun away. They will never lay eggs unless the sap sours.

MR. SLAUGHTER: In Delaware we prune very little, except taking out the dead wood and broken limbs. My friend spoke about the trees growing there in the corners of the fence; they won't grow there. They used to when I was a boy, but now we have to put them up where we can cultivate; still we do very little pruning, except as I have said, taking out the dead wood and cutting back. When we want to put a new top on a tree we would then cut it off. As to the gentleman inquiring about his apricots, my advice would be to take a mattock and dig them out about two feet below the surface of the earth. I think that would be the most profitable way to handle them.

MR. LOCKE: I am a professional non-pruner; I believe a great deal in nature. This discussion seems to be interminable from the diversity of conditions under which each one is placed. I have heard of an Irishman who was taking a horseback ride, and procured a horse and so forth, but he mounted so that his head and the horse's were facing a different direction, and his friend said: "Patrick, you have got on that horse wrong." "Faith," said he, "how do you know which way I am going to go?" Now, I have had experience in the peach business for over thirty years, and I have a little orchard alongside of the road where people pass and they criticise my pruning, and they want to know why I didn't prune sooner or differently, and I thought of this Irishman, "How do you know which way I am going," or what I am doing this for. They know nothing of the conditions under which I am pruning those trees. I have often lost a crop of peaches by frost. Once I lost three crops in succession; I got a little discouraged at that and said: "I will not prune them until I find the frost has left some to prune off." In the meantime I took good care of the trees, kept them well cultivated; I would cut out some of the biggest branches, but I would not give them a systematic pruning, because if they did not bear I would lose all my labor, and I conceived the idea that I would lose less peaches and be more likely to get a crop if I did not prune, leaving all the long branches growing out; also that the leafing out of the tree had a protective influence against the frost; and I think I have some evi-

dence that it would be so; in fact, one year after I had taken off considerable brush from my trees I took some of it and threw it over one tree which had rather a broad spreading top, so that I could do so without any stepladder. I did this to see if I could not protect it from the frost, and that year it was about the only tree I had peaches on; it did protect it. It was the same as leaving the limbs on late and pruning after the peaches were formed; and now that is my practice and I have had excellent results, the best I have had in my thirty-three or thirty-four years' experience in growing peaches in California. I leave my peaches before I prune them at all until they want thinning, until they have passed the frost; then I take my stepladder and one of my men and tell him what I want. We commence then with the pruning shears and cut off those limbs that are full of peaches; you can see how much of a limb to cut. A great many will say you have got to cut a great deal in order to save a good deal of the labor of thinning, but how much shall you cut to do that? If from the frost or any other cause your peach tree bears very sparsely, you cut off two thirds of the last year's growth. If the trees are healthy that is about the rule. If you keep your trees growing healthy you need to cut off two thirds for the sake of thinning the fruit. Suppose you go at it and do that; suppose a frost comes, or from some other cause your peach tree bears a very light crop; don't you see you have cut off a great deal too much. You have got a light crop on your trees, whereas if you left the limbs until you discovered how much fruit you really had on them, you could have so pruned as to have a nice crop of peaches that year; and, by the way, the peach tree, if well taken care of, ought to produce a fine crop every year. I prune the tree according to the proportion of fruit that is on it. If the limb is, say two feet long with only four or five peaches on it, I will see how far they are apart; in general I calculate to prune peaches so that they shall not be within four or five or six inches of each other. One other thing I have learned from experience: after a destructive frost the only peaches we would have would be on the topmost limbs of the tree, indicating that the higher you get from the ground the less frost. Now, I prune to run my trees up; I don't care how high they grow. I have got some at least twenty feet high, and in many years all the peaches I get will be on those tall limbs. In relation to the variety of peaches, every man has got to learn for himself the variety of peaches that thrives where he lives. Here in this county the Late Crawford, which has been recommended to us as a fine peach, does nothing. I think it must be too late.

Recess was then taken till evening at 7:30.

EVENING SESSION.

FLORAL CULTURE, WILD FLOWERS, AND ORNAMENTAL PLANTS.

WILD FLOWERS.

By MISS LILLIAN HOWARD, of Santa Cruz.

The great mass of wild flowers form the unconsidered trifles of our fields and plains. They owe no thanks to man, for he does not care to perpetuate them, neither have they fear of him, for they do not, as a class, infringe upon his domain. A few may please him by their brilliancy of coloring, as they grow in masses, and blend harmoniously with some pleasing landscape; their patches and bands of blue and white, and their long stretches of gold and orange may compel attention and even admiration. A few may please the casual observer by the beauty or peculiarity of their forms, as in the case of the rose, the lily, the dicentre, and the lady slipper.

A few have become general favorites on account of their extreme delicacy of form and color, as the baby blue eyes and the lilybell. But it remains a melancholy fact that the popular expression is a cynical smile and a suppressed murmur of *weeds* when the subject is broached.

Well, there are weeds and weeds. A few of our flowers have become social outcasts, and lift their dainty cups rather saucily, without receiving an admiring glance, except from some misguided botanist, or, maybe, a sentimental but unsophisticated young lady, who is informed, with a covert smile, that she may have a whole county full, and welcome, if she will only pick them out. The bind weed, red sorrel, and the so-called yellow heliotrope may serve to point a moral, and arouse a smile at the expense of an enthusiast.

Weeds? And how different they really are from weeds. The real weed is as much of an aristocrat as wheat or corn, and usually gets the same amount of cultivation. He lives by his wits, but gets the best the land affords. Of course we do not mean the timid one that peeps up along the wayside or in neglected fence corners, or takes unto itself a bit of waste land, to be cast out the first time the soil is turned by the plow. We mean the kind that tries to take the whole farm; wants to grow in the mellowest soil; overshadows the young crop above ground, and sends out millions of little roots to choke it off under ground. The flowers are inconspicuous, that it may not waste its substance in show. Its seeds are produced in countless numbers, and of course they are ripened and scattered before the crop is ready to be gathered. These seeds are furnished with quaint devices for preservation and dissemination, as burs to catch the coats of passing animals, little hooks to anchor themselves to the ground or other weeds, twisted awns to cling to the ground, down that will float them far and wide on the breeze, and lastly a bitter or nauseous taste, or a gummy coat to discourage the browsing propensity of animals. Whatever plan man or beast contrives against them they try to meet it in time with a cunning device for defense;

so, after a long and relentless war, our most troublesome weeds are developed.

Their vitality has furnished a subject for epigram and moral in all ages, and the longer they have contended against man the more exasperating they are. For it is a well-known fact that the strong, aggressive weeds of older settled countries overtop and thin out the weeds of new countries which have not been compelled to fight for their lives. So weeds are as much the result of selection as the giant pansies, rainbow roses, and Japanese chrysanthemums of the horticulturist. Then, our flowers being the result of modifying circumstances and conditions through a long course of years, whatever serves as a distinguishing mark in our cultivated as well as our wild species is the sign to tell the story of their lives to him who reads.

But there are always two sides to a story, and if the thistle and the cactus could tell of their wrongs, no doubt the story would reconcile us to their prickly skins. If, as I said, imitation is the sincerest flattery, what intelligence we must grant some of the wild flowers of our hot, dusty plains and hillsides. There grows the Mexican poppy, with spines and needles that would outstick a Canada thistle, and with the same dusty, white downed leaves as its thistle neighbor. A casual observer would readily mistake it, and it is only when the glory of its delicate white blossoms are unfolded that the cheat is discovered. Who and what was the enemy against which the cunning flower fairy first armed himself? That its defense is secure, the rash investigator can mournfully testify.

There must have been a wonderful omnivorous beast of the field prowling these plains in those old days, or it must have been a much starved one, for this poppy is not the only plant which has here thrice armed itself. A species of wild sage has adopted the same livery, and pushes out its curious long blue corollas with its salmon pink anthers from a bristling circle of prickles that would do honor to any thistle. Blue is the bee color fortunately, and I am sure no other creature would willingly face the outpost for the sake of the treasured honey.

The mentzelia is a co-resident of these advanced thinkers, and is almost converted to their ways; it is not quite so dusty, not so prickly, and much more showy than its neighbors. Protection is their motto, for on those wide stretches of dry country the race is to the one who will not be eaten, and to the one who will not be killed by thirst; so the object of their little lives is to store up their moisture, to hide themselves, and to be unpalatable when found.

Leaving aside these flowers as denizens of the field and of the wood, and viewing them in the sacrilegious light of transplanting, our query is: "Which of these is suitable for cultivation?" This question has been answered for us in a great measure, for in many catalogues of Eastern growers our flowers are well represented. Among them are the California poppy in its yellow and gold, and its developed cardinal cousin, the nemophila, in all shades and sizes; the limnanthes, and the Mexican poppy, which has recently been a favorite, while the *Romneya Coulteri*, with its great crepe-like white blossoms, has won a lasting reputation for itself.

The tiger lily, the azalea, the rhododendron, where it will bear transplanting, the spires, the clematis, and the scarlet gooseberry, under the ambiguous name of coral plant, have already enriched our gardens, and where one can withdraw himself from the worship of varying

forms of our common garden flowers, he will find these most charming companions. They give a wild, saucy air to the garden, but it must be acknowledged that they look as if they felt degraded and longed to escape.

The salmon berry, with its red flowers and luscious-looking fruit, seems to be challenging one to a feast worthy of the gods; maybe the gods could eat them, but at present they are rather sour for the human palate. Culture ought to do something for them.

In our forests grow shrubs and trees that would lend themselves favorably to artistic gardening, as the chinquapin, with its gold-lined leaves, the California nutmeg or yew, and even our common buckeye, with heavy blue-green foliage, would prove invaluable if properly managed. The madrona, the tree-like manzanita, and the laurel have already been tried and have been heartily approved. They belong to our climate, and can be disposed of in landscape gardening with as much grace and relief as the foreign trees.

But our most beautiful wild flowers are found in our fields and in the borders of our forests, as the popularity of our cream-cups, nemophilas, gillias, and lupines show. Our lilybells, too, are a revelation in themselves, and an open hillside with yellow calochortus, Johnny-jumpups, and pink mallows is a feast for all eyes.

But the snowy lilybell is our poem; in color, in form, and in manner of growth it appeals to us, and though usually called by an uneuphonious name (harebell), it is still the one treasure of our fields most valued. It varies in color from a deep, dull crimson to a clear white, tinged with pink and green, and the pretty balls hang in clusters of from three to ten on their slender stems. Then its cousins of all colors, the golden lilybell, or Diogenes' lantern, the many-colored Mariposa lily, the white clustered variety with its long leaves, and the pale-lavender variety are almost as interesting as itself, and furnish many a suggestive page for the paragrapher, the sketcher, and the poet.

In fact the lily family is well represented in our State, and our fields can vie with our gardens in presenting this most graceful flower. The tiger lily, the white Washington lily, and some smaller varieties remind us in a dignified way that Dame Nature is still in the race with man for horticultural honors. The eagerness with which picnic-goers storm the preserves of the tiger lily is a lasting tribute to its beauty and grace. But, alas! the cows are just as fond of it, and only what they cannot reach is left for the human flower-lover. We respect the craft of the thistle now, and wish for armor for the lily.

In our hasty survey, we can pay only a passing tribute to the beautiful members of the pea tribe which flourish among us. In richness of color and in variety they are surpassed by few other flowers, and as it is always a pleasure to see a well-known face in a crowd, so we are glad to come across the familiar butterfly petals in a wilderness of new plants. The lupines—yellow, white, and all shades of blue and purple, with occasionally a pink stranger—the clovers, the vetches, thermopsis, and a host of kindred with most unsocial names, are among the gems which brighten our fertile land.

On the subject of names, let us present a brief plea. One is debarred, of course, from speaking of the scientific names; they are settled, as far as one can judge, well settled; but the local names, the home names, are insufficient, and so loosely applied that it is simply exasperating to

try to verify many of them. There are a number of pretty names afloat which are applied to many flowers, as bluebells, wild pansy, and wild forget-me-nots, and there seems to be no particular flower that can prove its claim to the name. For instance, the name wild heliotrope is given to several widely varying plants, and there is a true heliotrope, rather insignificant in size, but even the least has a right to its name.

In one case I saw, in a widely advertised collection of wild flowers, a flower-cluster nearly three inches long, bright scarlet in color, labeled with the name bur-clover. Of course, one does not wish to be too particular, but the line must be drawn somewhere, and a reasonable amount of accuracy is not to be despised.

Many of our beautiful and effective plants have no common English names, and it is so easy to prefix *wild* to some familiar name, and so hand it down, a delusion and a snare to all botanically inclined students. Most of our native flowers probably have Spanish names, and musical ones, too, given by the people who have lived with them, have seen, with a poetic eye, their many charms, and have had many tender associations connected with them. These names we should preserve, as far as possible, for they are usually pointed, picturesque, and perpetuate the traditions of the soil. Our madrona and manzanita are good examples of this class of names, and they seem to be popular; others, as chicolote, yerba buena, and yerba santa, are fully as pleasant to the ear.

For a long time it was the style to adore wild flowers, but a careful observer could see that all who adored them chose the largest and brightest, or those most easily obtained; the true flower-lover then, as now, guarded his treasures with a somewhat jealous eye.

The popularity our flowers enjoy in other places may be only another proof of the old proverb, "A prophet is not without honor;" but the interest shown in the recent field-flower contest among the pupils of our county proves that we do not need to hear from abroad before learning to value our home treasures.

DISCUSSION ON WILD FLOWERS.

MISS HOWARD: I have been asked to say a few words about the golden rod. As you all know, there has been quite a discussion going on in the papers for some time, and the golden rod was at last chosen for the national flower. I have a small specimen here, a native of California, which does not grow so large and so beautiful as it does in the Eastern States. This is the kind that grows here. I think I heard something recently about a flower to be chosen as an emblem of the State. I do not know whether or not anything has been spoken of here about it, or whether anything has been done. I would like to hear from some of the rest on that subject. I have a little more to say on the subject of the flower selected by each State. I believe in having a national flower; I think we are much greater as a nation than as a State. I have three flowers here [showing the paintings]—the California poppy you are all familiar with; one of the others is the *Romneya Coulterii*, of which I spoke this evening. The white calochortus is very common in this country, and familiar to all of us. I do not know whether or not its

range is as extensive over the State as the poppy. I have not a romneya here; I am sorry I didn't bring one, as I have it home, but this is the nearest to it of any of our flowers; the leaf is the same, and it is what I spoke of this evening as the Mexican poppy. The romneya grows in the southern part of the State, and is much larger than this.

QUESTION: Does the Mariposa lily grow outside of the State of California?

MISS HOWARD: I have been told that it grows in northern Texas, but I think the whole family is distinctly Californian.

THE STATE FLOWER.

MRS. McCANN: I had some friends, pioneers of the early days, who got off the steamship and rushed over the barren hills of San Francisco to find the gold. At last they saw a field yellow in the sunlight, and rushed pellmell to be the first to fill their pockets full and send home to their sweethearts, only to tumble head-foremost into a field of yellow poppies; and from that day to this the very name of California comes upon my mind when I see the yellow poppy and remember how disappointed were those pioneers who brought back only the yellow poppy and no gold. Therefore, to take the sense of the ladies and gentlemen, who also may be permitted to vote on this floor, I make a motion that the *Eschscholtzia Californica* be adopted as the State flower of California.

Adopted.

FORESTRY; REDWOODS.

By F. H. CLARK, of Yountville.

There are one or two points in regard to the culture of our local forests, as well as their preservation, that I wish to touch briefly upon, and to these I would call your attention.

Santa Cruz County contains within its limits about two hundred and eighty thousand acres of territory, of which, including the level area on Ben Lomond and in the Pajaro Valley, about seventy thousand acres are "flat" land, the balance consisting of mountains and narrow valleys, originally covered, for the most part, with forests of oak, madrones, pines, firs, and redwoods, interspersed with laurels, maples, sycamore, alder, cottonwood; in short, with the leading varieties of timber found in the State.

I have said that "originally" the forests covered the mountains and narrow valleys of the county; but this was before the lumber men and the tan-bark collectors commenced—about twenty years ago—their work of deforesting the county. During that period it is estimated that there has been cut at least five hundred million feet of lumber from sixteen thousand acres of land, and that fires, for the most part started to clear away brush, to drive deer and other game from their haunts, and by careless "campers" and herdsmen, have destroyed the forest growth over an equally large area.

There remains then, at this time, an area of probably one hundred and seventy-five thousand acres of what may be called "forest" land in the county. This is a large proportion, but in this area is included *all* that can in any sense be said to be covered with trees, and much of

it (such as the totally barren ridges and mountain tops, the frequent *potreros*—natural grassy openings in the woods—and the thousands of acres of steep hillside land covered only with scrubby chaparral and dense, prickly chamisal), all this must be deducted from the total amount. Then, again, there is a large area (about forty thousand acres) of choice "timber" land, which, being controlled by lumber companies, may be said to be virtually lost, as far as forests are concerned, to the county. Making these deductions we will have in Santa Cruz County, in less than fifty years, less than one twentieth of its area in "forest," by that term being meant land covered with a natural growth of the least valuable trees and shrubs. As for the really valuable and beautiful trees, such as redwoods, oaks, pines, and firs, there will be none left, save a few scattered clumps then carefully preserved by owners of vineyards, orchards, ranches, and country homes throughout the mountains.

As regards the ultimate fate of one of California's noble trees, the "tan" oak, the *Quercus densifolia* of the botanist, I may repeat here what I have already stated in a communication to one of the leading papers of San Francisco, and that is that there is used on this coast every year some thirty thousand cords of tan-bark—not the wood itself, but only its life-giving environment. To make up this thirty thousand cords of bark about one hundred and eighty thousand trees are annually felled; and these poor victims to man's rapacity include all, from the noble veterans whose trunk-girth is only to be measured by fathoms, to the tender sapling one can span with his hands. The former are felled and stripped up into their branches; the latter are girdled in their lower growth, and thus as effectually killed as though the woodman's ax had been laid at their roots.

According to the estimates made by practical "peelers," those whose business it is to exterminate this beautiful tree, there must be twenty-five square miles of forest land searched and despoiled each year to yield the "tan oak bark" required by the manufacture of leather in this State. Every season the "peeler" has to penetrate farther into the forests to procure the bark he covets. He slashes right and left on the mule track he makes through the forest. He *must*, to realize a profit on his contract, mow down, as relentless as Death, the great and small, the growth of a century, the saplings of but a few years' life. He leaves behind him the stark naked skeletons of great trees intermingled with the dying young. It is a war of extermination, in which the young and old, alike defenseless, fall before the weapon of a crude civilization, the keen, relentless ax of the woodman.

Still this beautiful and valuable tree struggles bravely against this destructive agency. It is found growing in all parts of the county, having a range in altitude from near the seashore in secluded spots, to the shady gorges of the mountains at an elevation of two thousand five hundred feet. The deeply channeled bark of its trunk, the dull, soft green of its foliage, and its large acorns, with queer, fuzzy cups, are in striking contrast with its constant neighbors, the smooth-limbed madrona and the noble redwoods. Isolated specimens indicate, by their habit of forming a wide-spreading shade, their value as an ornamental tree, while their rapidity of growth is an encouragement to those who desire to beautify their mountain homes with earth's finest forest children.

I have said that the "chestnut oak" responds easily and quickly to intelligent efforts made to protect its growth. As an illustration of this

I am permitted to use some facts given to me by a prominent county official who, in former years, was engaged in the reprehensible business of "clearing out" these fine trees, but who now, I am happy to say, condones his former fault in this respect, by strongly advocating the preservation of such as are left, and stands ready to prove the soundness of his conversion to the doctrine of the conservation of our forests by contributing all that he can to that end. This gentleman states that twenty-one years ago he felled the marketable "tan oaks" on one thousand acres of land in this county, *carefully avoiding injuring the young trees*.

Seventeen years after he made a raid on that new, young growth on the same land, and "cleared up" just one half of the original output.

And this oak is readily grown from the acorn, and the acorn can be readily obtained. There are hundreds of narrow, quiet ravines in this county where this beautiful tree would flourish, and all that is needed to secure within a few years picturesque groups is that the owners of such romantic glens shall, when visiting them (as they all do on mild winter days, when the hurry and bustle of gathering the products of vineyards and orchards is but a pleasant memory), take with them a pocketful of the acorns and plant them here and there. Doing so, they can count upon seeing the young trees grow, and can feel that they have fulfilled at least *one* of the paramount duties of man, which are said to be that he shall "leave children behind him, *plant trees*, and write a book." We all achieve the first; it is possible to all that they fulfill the second requirement; too many, perhaps, inflict upon a suffering public the third.

I wish to enlist your interest in another forest tree common to this county, and that is the Monterey pine (*Pinus insignis*). Having its native habitat upon the coast, restricted north and south within a few degrees of latitude, this pine is distinctively a Californian product. It is a noble tree in respect to its wealth of foliage, its symmetry, and its possible usefulness. It attracts the attention of all who look upon it. It well deserves the panegyric bestowed upon it by a gifted lady of San José: "Oh, those beautiful, mournful, music-haunted pines! They clothe the whole long promontory with loveliness. Wherever they have been undisturbed they spring up in tall, straight groups, and so mingle branch with branch, top with top, as to shut out the sunshine and almost hide the blue, over-reaching sky. But fire and tempest and the destructive ax have thinned out their ranks, until open spaces and broad vistas are the rule and not the exception."

Though this fine tree has its habitat on the coast—flourishing among the sand dunes—its seeds, if sown upon the dry uplands of the county, on steep slopes looking towards the sea, will germinate and grow, rewarding the planter in a few years with their wealth of odorous foliage, making glad the desert places.

Akin to the Monterey pine is the form familiar to those whose homes are in the Santa Cruz Mountains. There flourishes the knob-cone pine (*Pinus tuberculata*), and there this rare variety should be conserved. Quoting from Prof. J. G. Lemmon's report to the State Board of Forestry, it may be said that "the striking peculiarity of this pine is the persistence of all its yearly crop of cones, the oldest gray and weather-worn, the youngest shining with yellowish green luster; all, whether old or young, retaining their wonderful vitality." To secure the seeds of these, as well as of the Monterey pine, all that is required is that the

cones shall be gathered before they open (any time during the summer), and to then subject them to a rather high heat (such as given out from the oven of an ordinary stove). There follows then a queer ticking, as of an old fashioned watch, and the seeds are readily shaken from the open cone. These seeds, scattered a little below the surface of the sterile regions surmounting the mountain lines, will grow and beautify a region ordinarily stark and barren.

The *Pinus tuberculata*, or "sun-loving pine," as it is sometimes called, is the variety commonly found on the upper ridges of the Santa Cruz Mountains, and while those who are clearing land for cultivation on these slopes are grubbing out all the natural growth, it may be worth their while to spare the pines. The trees take up little space; they respond kindly to the cultivation of the soil about them; they are elegant in shape, rare in numbers, and should be carefully conserved. Moreover, when fires run through the dense underbrush in which they grow, the flames, flashing upwards to their tops, aid by their heat in opening the otherwise persistent cones, and thousands of young trees clothe the ground around the parent stem. These bear transplanting well, and should be used in decorating the homesteads of the Loma Prieta Range.

There is found in Santa Cruz another tree which, for its rareness, beauty, and usefulness, takes rank with the notable trees of the world. This is the *Torreya Californica*, or California nutmeg, a stately tree as found in Scott's Creek, and still beautiful, though scorched by fire, on the Loma Prieta Range. Under favorable circumstances this tree attains a growth of sixty or seventy feet in height, and its long slender branches are pendulous, simulating the grace of the weeping willow, while retaining its individuality as one of the finest yews known to man. Its abundant seeds, like the small cones of the redwood, grow freely in any moderately moist soil, and as they can be obtained at a trifling cost, they should be sown in our mountain gulches.

Having thus briefly mentioned some of the forest trees indigenous to this coast, and especially abundant in this county, it will be expected that I should say something about our "redwoods" (*Sequoia sempervirens*). Having made these noble trees an especial study during the past year, I approach them always, I may say, with reverence. As giants and patriarchs of the forest they stand alone. Nowhere throughout the world can be found living trees that are more majestic and inspiring. There is a grand symmetry in the growth of these great trees quite distinct from the sturdy habit of the ancient oaks of Europe, the towering grace of Australia's somber eucalypti, the pillared shade of the sacred banyan trees of India, or the dome-like, sepulchral forms of the great African baobabs, all of which have excited the admiration, yes, the worship, of man from remote ages.

Involuntarily one associates the sequoias in antiquity with the pyramids, and while wandering about their massive trunks one half expects to find there the ruins of fanes and temples as ancient as those on the banks of the Nile, or the quaintly sculptured monuments of the Taltec and Aztec races found half buried in the dense forests of Chiapas and Yucatan.

When the great trees we gaze upon were seedlings (such we still find in each early summer springing in thousands from the cool, damp earth from which their parent trees rise in towering beauty)—when those

great trees began their growth the Egyptian pyramids were fresh from their builders' hands, the foundation stones of those of South America were not yet laid.

In those dim distant days the very *land* from which they sprang was, the geologists affirm, yet newly upheaved from the ocean depths. The rugged ranges of the Sierras (on whose western slopes the *Sequoia gigantea* is only found) looked down upon the broad, shallow lake covering the valleys of the San Joaquin and Sacramento; while on the Santa Cruz range of hills the delicate foliage of the *Sequoia sempervirens* (our own redwoods) began to tinge with green the otherwise bare elevations.

It is a pleasure to linger in the redwoods to contemplate their greatness. Each tree has a well-marked individuality, a character, as it were, of its own, as marked, in its way, as the varied forms and features one meets in every assemblage of men of the same race. While all bear, in their more prominent features, the stamp of close family relationship, each illustrates in the highest degree the perpetuation of race characteristics. They combine in their perfect symmetry the ideal of the architect who strives to combine size and height with grace. The Eiffel tower, with its broad-spreading base and its towering height, is but an unconscious copy of the sequoia as we see it in its California home. The trees are grand without being oppressive; noble but not arrogant; lords of the soil that do not impoverish the land.

We seek their companionship with quiet satisfaction; for, in striking contrast with the heavy shade and gloomy depths of our great pine forests, the shadows in the densest growth of redwoods are made soft and semi-luminous by rays of sunlight piercing the feathery foliage, glistening through the pillared glades, illuminating the warm brown and somber gray trunks of the grand trees, and "awakening to more vivid tints of green the swaying branches sweeping the clear blue sky." And this commingling of light and shade gives to daylight in the redwoods a peculiar softness in keeping with the stillness of the scene.

As the bright light of a summer's day is softened and subdued by infiltration through the emerald spray clinging to the downward sweeping branches, so the winds that may be heard rushing with a muffled war through the slender spire high overhead, scarce stir the hazel's pendulous leaves or the feathery fronds of ferns clustered about the great tree roots. Now, on this occasion, as well as when we wander amongst the redwoods, the flight of time stays us in the contemplation of their beauty and grandeur.

Let me, then, conclude this most imperfect sketch with a word regarding the propagation of seedlings of the redwood, and the preservation of some small group of an ancient growth.

Bearing, as the trees do, a wealth of small cones from which the small, flat seeds easily escape, it is a not difficult task to gather the latter with the light debris about the parent tree. Scrape together all you find of loose vegetable matter beneath a bearing redwood late in the fall, and scatter this in damp ravines, on sheltered, moist hillside slopes, and you will be rewarded by a growth of young trees you can thin out at your pleasure.

As regards the preservation of the older trees, that is a more difficult matter. Not that they are going to decay, on the contrary, as noticed by Mr. John Muir, who has made the giant trees of the Sierras his lov-

ing study, "No one ever saw a diseased redwood." They are felled by storms, by earthquakes, and by the ax of the woodman. Here and there they are undermined by floods; but though eaten out by fires, reduced to mere shells, they still send out a vigorous growth of branch, and leaf, and fruit.

Their preservation depends upon a sentiment. As sentiment never yet annihilated a paying industry, we cannot hope to stay, wholly, the ax and saw of the lumberman. But popular opinion, combined with action, if directed intelligently towards the setting apart of some one section of the noble redwood forests (such as exist in the "Big Basin" region in this county), will, I believe, save for our present delight and for that of the generations who come after us, at least one grand forest of the *Sequoia sempervirens* such as the world cannot show elsewhere, such as a thousand years cannot reproduce.

That these efforts will be, are being in fact, made, none can gainsay. That they will be aided and encouraged by all who believe in the humanizing influence of "Nature in her visible form," we all believe; and that these efforts, thus sustained and encouraged, will be crowned with success, goes, I may say, without saying.

Adjourned till the following day at 10 o'clock A. M.

TRANSACTIONS OF THE FOURTH DAY.

SANTA CRUZ, November 21, 1890.

President COOPER in the chair.

REPORT OF COMMITTEE.

Mr. Adams presented the report of the Committee on California Fruits in the Eastern Market, as follows:

MR. PRESIDENT: Your committee to whom was referred the subject of fraudulent sale of Eastern or inferior California dried fruits under the names of our well known and first class products, have had the same under consideration, and beg leave to report as follows:

As to the facts in the matter, our only definite information has been the statements of Prof. C. H. Allen, made to the Convention yesterday, of facts which came under his personal observation while at the East in charge of the State exhibit known as "California on Wheels," which statement will form part of the record of this Convention, and need not be fully repeated here. In substance, Professor Allen said:

First—That he saw a sour and almost worthless product, which he believed to be Eastern dried Damson plums, marked and sold as "California Spanish prunes," a name, of course, entirely unknown to this State, and properly representing no fruit of which we have knowledge. In this case the mischief was increased by the fact that boxes in which this fraudulent fruit was found bore the brand of a firm whose connection with the fruit-shipping interests of this State has been such as to warrant Eastern dealers in supposing the fruit sold under their brand to be real California productions, true to name.

In this connection your committee recommend that the Secretary of this Convention send a verbatim report of the remarks of Professor Allen on this particular matter to the firm named by him, with the suggestion that they address to the State Board of Horticulture a letter stating whether they are selling at the East any dried fruit under the name of "California Spanish prunes," and if so, to accompany the letter with a sample of such product.

Second—That he saw dried Egg plums sold as "Silver prunes," and heard them loudly and properly denounced as being sour and unpalatable, instead of a sweet prune as had been represented. The casual conversation about this Convention leads your committee to believe that this form of fraud is in general practice in the trade, to the very great injury of the producers of that excellent fruit—the genuine Silver prune. "Egg plums" is another name under which the very sour plum is sold.

Third—That from what he saw it is his belief that brands of producers are habitually removed and replaced by the brands of brokers, thus rendering it impossible for the careful and conscientious producer here to obtain any credit for his careful and conscientious work.

Your committee respectfully suggests that frauds of this kind are to be expected, to the injury of any business which becomes successful, and that the only possible remedy is the simple one usually adopted in other lines of business—of promptly exposing the swindlers, and warning the people against their practices.

Your committee is using this language advisedly, as more closely than any other expressing their precise meaning. Whoever sells some unknown product as "California Spanish prunes," instead of giving the product its true name; or calls "Egg plums" "Egg prunes," when there is no prune called the "Egg prune;" or knowingly sells Egg plums under the name of "Silver prunes," is a deliberate swindler; and no custom or competition can any more justify such practices than the custom of other criminals can justify them in committing the crimes to which *they* may be addicted.

Your committee suggests that the proper remedy for this state of things is publicity. It can probably be stopped by maintaining standing yearly advertisements, for a year or two to come, in the leading newspapers of the principal Eastern sections, calling attention to these brands, and warning people against them. Any experienced business man can soon put a stop to the business, if the fruit growers will give him the money to do it. If not prepared to put up the money to pay for exposing the rascals, the matter may as well be dropped. We can no more get rid of these pests without expense than we can exterminate without cost the burrowing gophers, whom they resemble.

Touching the practice of erasing producers' marks and substituting those of brokers, the only remedy is by advertisement, to educate consumers to demand dried fruits in original packages, with producer's name, and to mark the packages by actual branding,

or other indelible mark. The organization of the California Dried Fruit Union, which is apparently not likely to prosper as a shipper of fruit, might be utilized by employing it to adopt a trademark, and sell the branded box ends to members only, the association protecting itself by accepting as members only those who were properly vouched for as honest men, and who would, in addition, give written pledges of strictly complying, in their packing, with specified rules.

Rigid integrity and fair dealing are certain, if steadily pursued, to bring their proper reward; so is the opposite, and, as no matter who it is that sells bad fruit under our name, the California producer is certain to get the discredit of it, it is of the utmost importance that we take all steps necessary to protect ourselves. As this work can be properly done only by a permanent body, your committee recommend that the Secretary of this Convention be instructed to transmit to the State Horticultural Society a copy of the remarks of Professor Allen, and of this report, with the request of this Convention that the society investigate the subject, and take such measures in relation thereto as the facts may appear to demand.

Respectfully submitted.

EDWARD F. ADAMS,
D. M. LOCKE,
GEORGE HUSSMANN,
Committee.

Report adopted.

TABLE GRAPES.

By W. H. GALBRAITH, of Santa Cruz.

It is recorded in sacred history that those who went to spy out the land returned laden with grapes, and declared Canaan to be a region abounding in the wealth of nature's products—a land flowing with milk and honey. But we notice that they brought neither milk nor honey as a proof of the wonderful richness of the promised land. They returned with a bunch of grapes so large and heavy that it had to be swung on a pole, and carried between two men, and they were, without doubt, table grapes.

It seems, in all ages of the world, and in all climes where the fruits of the earth are most luxuriant, that the grape has ever been considered the highest type of fruit that nature, with lavish hand, has bestowed upon mankind. In both sacred and profane history no other fruit of the earth is so frequently mentioned as the grape, especially if we include the products thereof; and no other vegetable growth is so often employed by way of figurative illustration as the vine.

The history of the vine is contemporaneous with the history of man; but the grapes of Eschol could not have been more attractive to the children of Israel than are the grapes of California to our less favored brethren of the snowy East.

We sometimes wonder, however, whether the old rule as to the unattained would not have held good in the case of the Israelites, and whether unlimited indulgence in the fruits of the promised land would not have engendered indifference, even to the extravagance of nature. However that may have been, if the market price of table grapes were taken as the criterion by which to judge of the favor in which they are held by the general public, certainly, in this year of grace 1890, we would be compelled to put the grape very low in the scale.

It is difficult to believe that so toothsome, palatable, and healthful a fruit as the table grape of California can fall into disfavor with the public. It is more probable the people have become surfeited with a good thing, and, like the man who had eaten gluttonously at the table, have lost their appetites.

The season for the grape is a long one. From late spring till early

winter—a period of nearly six months—the precocious vines of Vacaville and the more backward vines of Santa Cruz can, together, keep the market supplied with grapes to a greater or less extent.

In Santa Cruz County the harvest of table grapes is but well commenced, and, unless severe weather should set it, will continue till January.

The standard varieties of table grapes are common to all sections of the State, and their names are so familiar that they need not be mentioned here. It might be said, in passing, that certain varieties are more successfully cultivated in the cool, moist climate of the coast region than they are in the hot interior valleys, where they are subject to sunburn—a defect almost unknown in this county.

It is well known that grapes are not standing shipment to distant points as well this year as they have done in years past. Inasmuch as the autumn has been exceptionally fine for ripening grapes, we must look for some other cause for this failure to stand transportation. It is probable that the grape, in common with the apple and prune, has suffered from too much water—a misfortune which will readily elicit sympathy from all true friends of the grape.

The subject assigned me is not a very profound one, nor one upon which there is much to be said. The raising of the table grape is about on a par with the raising of potatoes, as far as skill is concerned, and the intelligence required to produce excellent table grapes is not to be compared with that necessary to the production of excellent wines; consequently, we may expect prices to rule low, especially on this coast.

Occasionally, through some act of Providence, one section may gain a temporary advantage over another section, but on the whole there will be no great profit to the producer of table grapes, even though he sell in the most favored markets. Fair profits are all that table grape growers need expect, and perhaps it is just as well for us to learn to be content with reasonable returns for that which makes no excessive demands either upon purse or brain. The fact is there is nothing in the line of agriculture that can be relied upon to yield large returns to the husbandman that does not require more than ordinary perseverance and intelligence to successfully carry it on. The veriest dolt may stumble upon a deposit of gold nuggets that will make him rich, while the man of genius may labor for years to overcome a refractory ore which, though rich in precious metal, would have been passed as worthless by the unskilled miner.

So the world will go on. Table grapes will be produced in the greatest profusion. Our people will feed upon the very food of the gods as freely and as economically as they feed upon potatoes, and with just as much irreverence. Occasionally the producer will get the people into a corner on grapes, just as he does on potatoes. He will then make some money, and be encouraged to go on in the hope of more opportunities of a similar character. In fact, hope, the mainspring of life, is preëminently the agriculturist's dependence, especially in California. Without the hope of wars in Europe, failures of the Delaware peach crop, frosts, early frosts in Ohio and New York, and other hopes of an equally unselfish character, what ambition would be left in the hearts of husbandmen to plant the seed and prune the vine. This hope—that an all-wise Providence will so shape events as to favor us a little oftener than he does remote

peoples—has a wonderfully buoyant effect, and “makes us rather bear those ills we have than fly to others that we know not of.”

The table grape is ubiquitous and quite prolific. It grows readily in this State from north to south and from east to west. It finds a congenial soil either in the alluvium of the valley or upon the sand-rock ridges of our hills and mountains. Not more than eight miles from this place I have seen an acre of vines planted upon the top of a hill in thin, sandy soil that produced in a single season twenty-two tons of table grapes. In this county, provided the soil is not too heavy, the table grape flourishes, whether the vine be trained with a round head or spread out on wires, though, owing to the heavy growth of foliage, it is generally conceded that the latter method is more desirable, in order to give the vine more sunlight and air.

There is one peculiar disadvantage in raising late table grapes in this county. We sometimes have to hope against hope. I remember one season that we grape growers were having a fine harvest, and the season had advanced well into December without a damaging rain; furthermore, grapes were bringing good prices and we were hoping for a continuance of the same sort of dispensation. But over in the Santa Clara Valley—just the other side of Loma Prieta—the wheat farmers were becoming anxious about their plowing, and so strongly did they hope for rain that their hopes found expression in the form of prayer, and the news came to us through the newspapers that the priests on the other side of the mountains were praying for rain.

By some sort of conventionalism or other it has become an accepted article in the world's creed that it is entirely proper to pray *for* rain, but equally improper to pray *against* it. Now, it naturally occurred to us on this side of the mountains that if the priests' supplications were favorably heard, some droppings might fall on us—a consummation devoutly to be abhorred. Well, after all, this little circumstance but epitomizes the world.

Thus, ladies and gentlemen, I have rather unwillingly treated a subject about which there is less interest than there would be if the table grape had more foes and a more certain market.

OLIVE CULTURE.

By W. A. HAYNE, JR., of Santa Barbara.

Feeling sure that olive culture is to become one of the leading industries of California, I deem it of more importance to give my own practical experience than to write anything about the historical olive tree, or give any flowery picture of what was done thousands of years ago with this famous tree.

My own experience in olive culture might be of benefit to those who are contemplating planting olives; I therefore venture to give some of my ideas. I say my practical experience, because I believe in this lies the only true road to success. Much has been written about olive culture, and mainly in regard to European experience. From what I have read in French, Italian, and Spanish works, while at the same time I have steadily grown the olive for nine years, I do not believe that foreign ideas will do to follow out, nor do they apply to California.

I certainly would not have known this had I not found it out by the practical manipulation of olive cuttings and olive trees, as the thing is worked in this State. One idea which seems to prevail is that the olive tree will grow and thrive on thin, poor land, rocky land, in fact any sort of land; that all the useless spots on a place will grow olives finely; that the Lord made these spots on the earth for the olive. I do not blame a man who has had no experience for at once believing this; it is natural that he should; I at one time thought it must be so. My experience, however, has taught me better. I will admit that the olive tree is hardy, and that it will live with very little care, but those of us who plant olives do not propose to be satisfied with merely seeing the tree live; we want it to grow, and grow big, and hurry up in every respect.

I have planted trees where I could not cultivate them—among the rocks—and at the same time I have planted them where I could do good cultivating, and at the end of two years it would be hard to convince a stranger that the trees thus cared for were really of the same age and planted out in orchard at the very same time. The idea of sterile, thin, rough land being good for the olive is all nonsense. I dare say that many a man has refused to purchase good land for his orchard of olives, because he was led to suppose that \$2 land was as suitable. I do not pretend to say that one must have rich, heavy lowland for olives; this would be almost as bad for the tree as the poor land which I have described. The first described land I would recommend for goats; the second, heavy lowland, for corn and pumpkins. We have plenty of other kinds of land—soil that is better than the goat land, and yet not so expensive as the corn land. My experience has shown me that the olive tree does best in places where the soil is deep, and especially where the land is new; but the ground must be of a light character, easy to keep loose; sand or gravel mixed in is very good, but not necessary; especially must it be naturally well drained and have a good exposure. The water must drain off from the roots, leaving the ground moist, but not soggy. Most of my trees are planted thirty feet apart; some are twenty-five feet. I prefer a greater to a less distance.

To save expense have your land as near level or gently sloping as possible. Leave the ends of the rows far enough from the fence to enable the plowman to easily swing a four or six-horse team; in this way much money will be saved in cultivating. Where land is cut and broken, or rough and stony, one, or at most, two-horse teams must be run, and thus four or five men must be employed where one man would do if the above plan is carried out in laying out an orchard. One live man can cultivate an orchard of five thousand trees for three or four years, with only occasionally having a little help. Of course, after this time there will be considerable pruning, and soon after fruit picking will require more labor. Children, however, if looked after, can gather the berries as well as men, and it costs very much less.

In regard to propagating the olive, I have had much experience. I first commenced to propagate them from cuttings fifteen inches long and of all thicknesses; I planted them in ditches four feet apart, and in the row from ten to twelve inches, covering nearly the whole cutting, hardly exposing any of the top. I cultivated them well, and those that grew when two years old were ready to plant out in orchard form. In using large cuttings, however, many will die, and one cannot count on getting a good percentage of them to come. In fact, this old method does not

pay any longer, when one raises trees as I do for the market, and as I raise many thousands for sale I have abandoned this method.

Besides what I have here mentioned, there is another very important thing. The larger the cuttings are the less roots they develop. Most all of the nurserymen now are propagating from what they call "tips," that is, the extreme ends of the branches; these are easily obtained, which make it an inducement. This method I have carefully experimented with, and have about abandoned it. It is a very slow way, and those that do root when a year old are such little bits of things that it is really discouraging. The roots, however, that they develop are pretty good, only they seem feeble and make slow growth.

The plan that I now have hit on is a much surer way and develops remarkable roots, and grows five times faster than the "tip" method. I use sprouts taken from trees in bearing; they make a very thrifty, fast-growing tree. I now have over eighty thousand started in this way, and I shall for the future propagate after this method. One thing I should advise never being done, and that is to plant a large cutting where it is always expected to remain, for this reason: The olive tends to have a surface root, and if the tree is never transplanted and set deeper the roots will be too near the surface, and when the tree grows a good heavy top, and the happy orchardist thinks that all is well, there will come a heavy rain which will lay the tree as flat as a flounder, and no staking will ever insure the tree against other storms that will follow. Nothing is more discouraging than after four or five years of care to wake up some fine morning and see hundreds of your trees flat on the ground. What I here mention is only what experience has taught me; transplant, therefore, from the nursery and get all roots well down.

I have planted several large orchards in the Santa Ynez Valley, in Santa Barbara County. The one I am now interested in has one hundred and fourteen acres in olives. There are about thirty thousand olive trees growing in the valley, most of which I have raised. The trees are now coming into bearing. This part of the county is attracting much attention, and it is looked upon as a grand place for olives. A company has recently been formed, and two thousand acres of land have been purchased, all of which is to be planted in olives. I doubt very much if there will be or is such a vast olive orchard anywhere in California as this contemplated one. The Santa Ynez olive oil is to become a famous brand, as the company I have mentioned will spare no expense to make it known the world over.

THE MANUFACTURE OF OLIVE OIL, AS PRACTICED IN EUROPE.

By L. PAPARELLI, of Berkeley.

RIPENING AND PICKING OF OLIVES.

The ripening and picking of olives affect very materially the olive oil industry, and, therefore, in gathering them their degree of maturity should be closely noted, for on that depends, in a great measure, the quantity and quality of the oil that will be obtained. The ripening of olives varies greatly according to the nature of the soil and of the

climate; of the exposure of the plantation and of the tree; also, according to the variety cultivated and the kind of manure used.

In warm climates and under the influence of strong sunlight the olive ripens more quickly, and in general gives a heavy tinted oil, rich in special aromatic matters. In cold climates, on the contrary, the ripening is retarded and the oils produced are lighter, clearer, and whiter. In moist or rainy climates the olive ripens very late, and the quantity of oil it gives is less. In poor, clayey soils the maturity is retarded and the yield of oil small. In a fertile, calcareous soil, slightly moist, warm and rich in phosphates, the ripening is generally normal and the yield much more abundant. The olive grower, in seeking to enrich his soil, should choose those manures which will hasten the maturing of his crop and at the same time increase its quantity and quality. Finally, the maturity will be early or late according to the variety cultivated, and according to the northern or southern exposure of the tree, or of its branches; also, according to the form given to the tree in pruning, and to the amount of cultivation given to the soil.

In olive oil making the maturity of the olive should be considered from an industrial standpoint, not from a physiological one; thus the gathering of the olive should be governed by the quantity and quality of oil that it is desired to produce.

The ripening of the olive is marked by four variations in the color of the pellicle: (1) From olive-green to lemon-yellow; (2) from lemon-yellow to red or purplish-red; (3) from purplish-red to wine-red; (4) from wine-red to a velvety black. Generally, under moderately favorable conditions of soil and climate, the velvety-black color will mark the proper time for gathering the olive for industrial uses, though the ripening is physiologically continued for some time longer. However, the exterior coloration of the olive is not an infallible sign of its ripeness, for there are modifications in this coloration, and variations in its intensity, dependent on the different varieties cultivated. It should also be borne in mind that the velvety-black tint in olives grown in a cold climate does not represent the same degree of ripeness that the same tint does in olives grown in a warmer one; so that these and other general considerations, though giving an approximate idea of when to gather the crop, must be supplemented by local experience, which alone can determine the exact time. Whilst noting the color of the outside of the olive, it must also be cut, and the pulp examined to see whether it is whitish or colored, observing also the quantity of water and the particles of oil it contains. Notice should also be taken of the stone, whether it is still white or has become brown; and of the taste of the juice, whether sweet or bitter, and so on.

If, in the extraction of the oil, high quality is the object in view, the olives must be gathered when they show the velvety-black color in cold climates; but, as in warm climates, this color corresponds to a certain overripeness, in order to obtain an oil of equal delicacy the fruit must be gathered whilst still yellowish, and hardly commencing to redden. If, on the contrary, the oil maker cares little about the high quality of his oil, but aims principally at quantity, he can gather his olives at their complete maturity. He ought, however, never to leave them on the trees longer than this, for they will gain nothing in oil, and run the risk of being spoiled by climatic causes, or by birds and insects; and, in this case, the oil he will obtain will be of even inferior quality to

that intended, and it will keep poorly. Summarily, then, it may be said that olives gathered a little *before* their perfect maturity yield an oil of superior delicacy and fruity taste. Those gathered a month later give an oil of ordinary quality, whilst those gathered very late give a very inferior oil, which can only be used in the manufacture of soap, or for illuminating and lubricating purposes, etc.

The oils furnished by fruit of different degrees of maturity may be characterized thus: Very ripe olives furnish a bitter oil; those which are nearly ripe give an oil which has a fruity taste, and, everything considered, is better than any of the others. Olives which are completely ripe produce an oil with a strong flavor which is hardly agreeable, and is subject to becoming rancid; overripe olives yield a very greasy, thick oil, which it is very difficult to keep from spoiling.

METHODS OF GATHERING THE OLIVES.

The ripening of the olives not being uniform on all trees, and varying even on the same tree, two or three separate pickings are generally made. This should be done in good weather, when the atmosphere is clear and dry, and when the soil is not damp from previous rains. Four ways of gathering the olives are practiced: (1) Picking up those which have fallen on the ground; (2) picking by hand; (3) beating the trees; (4) shaking the branches. The falling of the olives may be caused by climatic influences, or by animals, or finally by overripeness. These fallen olives are gathered and kept separate, to be used for the making of an oil of inferior quality.

Hand-picking is the method most to be recommended, as it does not injure the fruit in any way; and in a country like California, where the olive trees have not yet arrived at any great height, it should be practiced exclusively. Hand baskets are the best receptacles to use in this way of gathering.

Beating the tree with a pole or stick is the worst possible way of harvesting, and should only be practiced in exceptional cases, as it damages both the fruit and the crop, doing harm also to future crops.

Shaking the branches to make the olives fall, though less pernicious than beating the tree, is not to be recommended except in certain cases; that is, when from the height of the tree or the extent of the branches the olives grow out of reach of the workman's hand. As shaking the tree only detaches the spoilt or overripe fruit, it cannot be considered as a rational mode of harvesting. The conclusion then is, that it is absolutely necessary to pick by hand if we wish to avoid all danger of injuring the quality of the oil, or of lessening the future production of the tree. Beating and shaking should be limited to those exceptional cases where the olives cannot be reached by any available means by the hand of the workman. It must not be forgotten to spread cloth sheets under the tree to save the olives from being still more damaged by falling directly on the bare soil.

SELECTION AND PRESERVATION OF OLIVES.

The olives should be selected to a certain extent during the gathering, and more completely and carefully afterwards at the oil mill. This selection is of great importance, as the fruit communicates to the oil all the qualities and all the defects that it possesses when worked.

To transport the olives from the orchard to the oil mill sacks should never be used, but some receptacle with unyielding sides, in order to protect the fruit from being damaged on the way. For this purpose baskets of different sizes and shapes are the most suitable, but in case they cannot be procured, whatever is used must dry easily and not be too porous or absorbent, like soft wood.

The handling of the olives in filling and emptying the baskets should be done very carefully, in order not to break the skin, for in that case, the pulp being exposed to atmospheric agencies, fermentation is likely to set in, and extend to the rest, rendering it impossible to preserve them till the time desired. Oil made from such fruit will not only be inferior from the beginning, but will very quickly acquire a very disagreeable, rancid taste.

The object in selecting is to separate the fruit into four different qualities: (1) The good olives; (2) the dry, or frostbitten ones; (3) those which have been broken, crushed, or in any way damaged in gathering; (4) the spoilt olives. It is unnecessary to say that in sorting over, all leaves, twigs, etc., must be picked out.

It may be objected that to put all these details into practice would entail too great an expenditure of time and money; but when we consider the much greater price for which superfine oils can be sold, and the loss there will be in making only one grade of oil from the olives of different qualities, the practice of sorting will be found to be an economy.

Sorting by hand alone can only be practiced on a small scale, but by the use of an appropriate apparatus, moved by some motive power, large quantities can very quickly be sorted. This apparatus does not make a very complete selection, but is a great saving, even if the separation has to be finished by hand.

CONSERVATION OF OLIVES.

In a rational treatment of olives they ought to be kept as short a time as possible after picking, for to keep them for any length of time, in order to work them at one's convenience, is as little practicable as would be the keeping of a similar quantity of grapes to be crushed later. The principal end to be kept in view in the keeping of olives is the prevention of all heating of the mass that would cause fermentation. But as the time which elapses between the picking and the working should be as short as possible, the capacity of the oil mill should be proportionate to the size of the olive plantation; in this way the delays and losses which are so common in many oil factories will be avoided. Of course it is useless to attempt to preserve any but the olives picked by hand, and in the best condition; all others must be crushed immediately, as they cannot be preserved by any practical means.

The only good method of preservation is to make use of trays or shelves of willow or cane; all other methods offer insuperable objections. These trays are arranged on shelves in a cool and well-ventilated room, facing north. The thickness of the layer of olives on each tray ought to average two inches and a half, and under no circumstances should it exceed four inches. Frequent observations of temperature should be made on each layer, and if the temperature rises above 59 degrees Fahr-

enheit they had better be taken to the mill at once. In order to prevent any elevation of temperature it is necessary to turn over the olives often, and so cool them by aeration.

With regard to the quality of the oil, the keeping of the olives should be as brief as possible; it is always better to work them immediately, but as that is not generally possible, three or four days should be the limit; in this time the olives lose a portion of their water of vegetation, which, in a rainy season, is doubtless of some advantage.

Even when all the conditions for the preservation of the olives are favorable, they must not be kept too long, as the oil may lose but will never gain in quality. In conclusion, I may say that the oils of Nice and Lucca owe their reputation to the fact that there the olives are worked immediately after gathering, or are only kept a very short time, and with all the care demanded by a rational method of treatment.

SMALL FRUITS.

By MRS. L. U. McCANN, of Santa Cruz.

At the head of the list of small fruits, in my mind stands the Cuthbert raspberry. I remember ten years ago when we were dependent upon the old Antwerp raspberry for all our fruitage in that line in California; a beautiful raspberry, it is true, if you can pluck it from the vine and carry it at once to your table, but as a shipping fruit truly worthless, as in half a day the ripe fruit taken from the vine becomes so soft that any attempt to get it to San Francisco brings it there in a state of jam, instead of raspberries. Now, perhaps eight years ago, I read in an Eastern catalogue—that source of comfort or torture, as your purse may determine; that source from which we get our inspirations; those beautiful, elaborate Eastern catalogues, that paint such pictures of fruit that you never get—those books have caused me, many a time, to take the money given me for a Sunday bonnet and send my last cent on East for a new fruit; the lack of the bonnet didn't disturb me at all, but it would have been a torture I could not have borne had I not been able to get at least one or two of those high-priced berries, to see what California could do with so fair a stock. In this way, I know not by what little deprivations—a ribbon less, a pair of mended gloves instead of new ones—something of that kind, because in my family I am the only horticulturist—I sent East and paid \$6 a hundred for some of the far-famed Cuthbert raspberries, receiving some little specimens, and cultivated them with that mother love that women give to both children and plants, for I think it is a part of the same mental operation through which mothers take care of each; and by and by from those insignificant little rootlets came strong, vigorous, green branches, and I had them attended to myself with a hoe, bestowing the culture that they required, giving them every advantage that I could as to position and irrigation; and presently they came; for be sure, my brothers and sisters, that "whatsoever a man soweth, that shall he also reap." No fence-corner raspberry could have given me the results that I received from the labor which I bestowed upon my plants; and when in the winter time the old red Antwerps had shed their leaves and closed down business for the winter, in walking through my garden the beautiful Cuthbert grew green

and fair with the first rain, and commenced to send out tender blossoms, and the bees from all the country flocked in to find more sweetness there than anywhere around. I said to my husband, "See what a wonder! for once the catalogues have not misstated things; these are my Cuthberts; I do believe I will have a winter crop." "Nonsense," he said, "the first frost will nip your hopes and your berries too." But it did not. The frost came, and the Cuthberts laughed and went on bearing, and went on blooming and sprouting out, and presently we had all the berries we could eat, and for Thanksgiving a great bowl full, and we sent them to our neighbors, and for Christmas, too. On December 30th we were rather tired of raspberries, we had so many, and I wrote to that grand old paper, which has done so much to build up the horticultural interests of California—I sent to the "Rural Press" a little article; I also accompanied it with a box full of plants, the young branches laden with ripe fruit, and I said: "My dear sir, I do not ask you to take my statement—it is an incredible one, it seems to me—without proof, and I send you herewith a box of ripe berries, boughs full of fruit, branches just coming into blossom, and ask you if any other country than California can show the like on this thirtieth day of December."

Next to the Cuthbert raspberry in importance among raspberries, comes a very much neglected, but, to me, an exceedingly interesting character of plants, called the Black Cap raspberry. In vain I have tried to create an interest for them in the daily shipment of berries that go from my place. The Black Cap raspberry is almost unknown in California; those who have eaten them think they are far superior to the red variety; in fact, many a one who can't assimilate the others finds a delicious and appropriate fruit in the Black Cap varieties, and yet a little knowledge of horticultural principles is absolutely necessary to their successful culture. In the first place, like all raspberries, it is a biennial; that is, it is a plant which grows one year and bears fruit the next year, and dies; the fruit spur dies at the end of the second season; now, if you don't know that, with your red raspberry the cultivation, then, simply is the growth of the young sucker coming up. Now, in the ordinary raspberry, it will not bear until the coming season; with the Cuthbert, from its unparalleled strength and vigor, it sends shoots so strong and early that they are enabled by early fall to commence bearing a crop, which they simply throw in, over and above the main crop upon the same stem which will be borne the next summer season. The ordinary raspberry does not have a winter crop; the Cuthbert does, and the red berries are all over my plantation; it is coming into blossom, and will form new tops everywhere, and, if the season is favorable, will probably give raspberries for shipment every single day, or every other day, from now until March, when we reluctantly cut off the blooming tops, to trim back a little for the coming summer's crop. With the Black Cap raspberry the method of propagation is different. The red berry increases from suckers; the Black Cap berry is a tip-rooter, forming its new root from the end of the pendant tops, which droop heavily as they grow, until they reach the moistened soil, where they send out roots. If one wishes to propagate them and assist nature, as the drooping pendants touch the ground throw a little earth over them, and you have stronger roots for the next season, which you sever ordinarily at the bend, and your next year's plant is from this tip-root. Now, the ordinary plan of the ignorant grower is to say that these Black Cap

raspberries are very mean and straggling kind of things, and they go and cut them off, and destroy every chance of renewing their fruit; then they rush to the nurseryman, claiming that they were not very healthy: "They will die out, and I wish you would replace them." Knowledge is a very good thing sometimes, and especially in fruit growing.

As I make a claim to interest in small fruits of all kinds, and prove my interest by trying every single new variety that is recommended by reliable growers in the East, I should like to call your attention to the Early Harvest blackberry; its blossoms come with a tint of rose upon them, and look like blooming apple bushes. As a gentleman said, walking through my garden in the spring time, "If I had such pretty bushes as those I would put them on my front porch instead of roses." And then the handsome fruit, not so very large but so bright, so shiny, such a good shipper, as the originator says: "It eats so well, it bears so well, it sells so well, and it comes so early, that there should be no garden without it." Since it has already ripe berries in my garden before the Lawton and the Kittatinny have a bloom, of course we have the cream of the market with our Early Harvest before the others come in.

Now, in the way of novelties, there is the Golden Queen, lately originated by the originator of the Cuthbert. I have a very poor specimen, for my vines are very young, but still the golden color gives it a claim to be a novelty, especially as it has the Cuthbert habit of winter bearing. I do not believe for myself, however successful it may be as a plant, and the flavor is very delicate, that it will ever contend with the red raspberry, which is the favorite in the market; and that seems to be the difficulty with the Black Caps, of which the Sowhegan is the one that ripens best late. In vain I have sent them to San Francisco by the chestful, and a few men who have eaten that kind of berry in "mother's garden" way back East, came down to my commission man for them; but he says: "Don't send them in any big quantities, for there is no market for them." Once I sent a chest to him with the simple order: "Create a market, give this chest away; put it where you think it will do the most good."

From raspberries we come, of course, to strawberries. The variety here is the Parry, the most wonderful berry for prolific bearing, for size, coloring, flavor, and the immense power of endurance under all kinds of evil conditions, suiting all soils, being strong, vigorous, and immensely prolific.

There is another part of this fruit business that to me seems particularly interesting, and particularly of interest as a woman. It is sometimes pitiful, as I look back and wipe away a tear almost, as I think of the struggle for independence—yes, I put it that way, struggle for independence in learning how to make my berries a success. I knew nothing of packing, of shipping, and yet by and by, as we grew tired of berries—we had so many—I looked at the prices current of city papers and saw no quotations for raspberries; I thought, it is the day before New Year, I guess I will send some to the city. But my family laughed at it; how absurd, who will want them? "Well," I said, "we will see." I had tried once before to send some to the city; I knew nothing of the proper cases, and it is pitiful to think that I went over to a hardware store and found an empty box as the only thing fitted to carry a raspberry to the city, and I had not wit enough to mark, "This side up with care." Fortunately I have a friend in my commission merchant, who

kindly presented me with a proper case, and sent me some boxes, and said: "Try it again." And I did; this time, with a woman's love for the beautiful, I made my berries look so fair, contrasting, as nature does, the red and the green, and sent them to the city. I sent sixteen little boxes in my first case, and marked them this time with the stencils presented to me by my commission man: "This side up with care." When the result came back there was a little very business-like note to L. U. McCann, Esq. I held the letter in my hand and said: "How much do you reckon he gave me for my berries?" "Oh," they said, "seeing it is Christmas week, maybe it was two bits a box;" and some said "Maybe, as it is so near New Year, he will give you 50 cents; but no," they said, "thirty-five."

I opened the letter and out came a check for \$24 for my box of berries, and at last I was content. Before I had said to my boys: "Oh, help me weed this patch," but they had said: "Mother, hire a man;" and at last I had the ability to hire a man, and I did it, and my \$24 went to hire that man. Then I began business, and since then I have hired a half dozen, and as many as fifty, that is, boys and pickers of various kinds; for next to cultivation comes the question, How do you get your berries to market? I have the honor, gentlemen and ladies, to have been the originator of, I think, the best, simplest, and most comprehensive work of charity of any that I know of, the Women's Aid Work of Santa Cruz. I have always had a heart that went out in its sympathy for women and little children, and meant to combine in my small fruit growing some help for young boys and girls whose parents were poor, and yet who needed some sort of help in vacation, something to do that would not over-strain their young muscles and crook their tender backs, and so I have employed children in my garden as pickers in summer when the big crop was on—the vacations are just about the right time—and I have got as many as I liked; but the American boy is peculiar, and sometimes there are drawbacks in even this line of philanthropic work. At one time I had a large order from the city for a big wedding, and I had promised to fill it, and tried like a man to keep my promise. That day I had hired an extra set of pickers, but unfortunately I didn't know that I had the baseball nine of the Santa Cruz boys for pickers, and when a challenge came from the vandals outside the fence every last boy jumped that fence and played baseball, and the orders had to wait on that game.

It has been a study, too, the subject of picking berries; it is not everybody that can do it. I have had the misfortune to have had for three days a boy in my patch who was color blind, and the consequences of his picking need not be related, but his boxes were a sight to see. I wrote at last to my commission man: "I am fully aware that the bottom of this ladder is crowded, but I want no part or place in it; I am aiming at the top, and I want you to insure those who buy berries marked with the brand 'L. U. McCann' that, though I shall put the biggest ones on top to help you out, they will find good berries clear to the bottom. If they don't believe it turn them out; if there is a bad one in it don't charge them for it, and if you will give me any hint as to how better to present my berries to your market I shall be thankful for it." He wrote me a letter which I prize: "I have been in the commission business in San Francisco for twenty-five years, and there has never been sent, to my knowledge, to this city fruit so finely packed and so beauti-

fully gotten up." I simply tell this to encourage other women here who have aspirations such as I have had. I had forgotten to mention this: I claim in this fruit that I am showing you here a solution of some of the difficulties under which horticulturists labor in dry places where irrigation cannot be carried on; I claim in the Tap-root strawberry a solution of some of their troubles, as the ordinary strawberry has a root simply about three or four inches long, and specimens of this have a root that I have measured going down over eighteen inches, which will enable it to hold over in the dry season and still grow a grand crop in the wettest season or spring time.

The plant is new; it is not for sale; the fruit I am not yet quite satisfied with, and I am hybridizing it with the best varieties, and I expect in the future to be able to tell you more about it. This strawberry I should have called the "Californian," if another strawberry had not had that name, or the "Eureka," if that name were not already taken; and yet the plain, practical name, the "Tap-root," which tells what is the matter with it, seems to be the best.

VOTE OF THANKS.

MR. LELONG: Mr. President, I move that a special vote of thanks be tendered to Mrs. McCann for her able address.

Adopted unanimously by a rising vote.

A recess was then taken till 2 o'clock P. M.

AFTERNOON SESSION.

Vice-President AIKEN in the chair.

CITRUS CULTURE IN NORTHERN CALIFORNIA.

By S. S. BOYNTON, of Oroville.

The culture of citrus fruits in Northern California is no longer theoretical nor experimental; no longer a conceit, a supposition, nor a belief; but is a solid, enduring, self-evident, and living fact. The orange and lemon are there not dooryard ornaments, set as curiosities, placed in sheltered and protected spots, and are not grown under conditions more favorable than are elsewhere awarded in this State to these fruits.

The Northern Citrus Belt has long been the butt of ridicule, the subject of jest and laughter by those who had interests to subserve in crying down its merits and deriding its possibilities. The time is, however, near at hand when its true light will burst forth with a vividness and brilliancy little dreamed of by those who have not studied its grand capabilities and its enormous territorial extent. Within the next few years such a quantity of citrus fruits will be produced and shipped from that region as will forever set at rest all aspersions or reflections upon that land as a citrus fruit region. The day is by no means distant when its orange and lemon trees will be numbered by millions, and when its annual output of these fruits will amount to thousands of carloads. We are not talking at random upon this subject, nor are we carried

away by enthusiasm. We have given the subject not only months but years of patient study and know whereof we speak. For a full score and ten years the historic orange tree at Bidwell Bar, in Butte County, two hundred miles north of where we now are, has blossomed and borne fruit without the loss of a single crop, and stands to-day a mute but eloquent, green and living witness whose testimony is worthy of consideration and belief. While in a hundred spots throughout the counties of Butte, Yuba, Placer, and others that might be named, oranges, lemons, and olives have been in bearing for the past twenty years, yet citrus culture, in its broad and commercial sense, is still in its swaddling clothes.

In September, 1885, in the town of Oroville, the first suggestion was made of holding a citrus fair in Northern California. Then the Sacramento "Bee" caught up the idea, and asserted that the citizens of Oroville knew that oranges could be grown there, but what was needed was to convince others of this fact. It urged that a citrus fair held in Sacramento, the capital of the State, ought to and would accomplish this purpose. The residents of Oroville coincided with the statements of the Sacramento journals, and those of other towns fell into line. The business men of the Capital City made that exhibition a reality, and fruit from twelve different counties was displayed at the first citrus fair of Northern California. That extensive, marvelous, and splendid display of the semi-tropical productions of the northern part of this State at once, and for the first time, awakened the people of that region to the possibilities of their soil and climate, and was the direct cause of the great planting of citrus trees that has since taken place. The first fair was held in January of 1886, so that the oldest trees put out since that date, and which comprise fully nine tenths of the total number of the whole region, are only four years old at the present time.

It will thus be seen that citrus planting on an extended scale is a new industry in Northern California. The first man to be aroused and stimulated to action was Hon. John C. Gray, of Oroville, who left the pavilion in which that fair was being held, hurried to his home, had twenty acres of land prepared, went to Santa Clara County and purchased two thousand young olive trees, and while the memory of the fair was still fresh in the minds of all, he had these two thousand young trees planted in Butte County soil. He has since continued in the line thus begun, and has now ten thousand young and thrifty olive trees, and from several hundred of these he will this year gather fruit. That he made no financial mistake is evident from the fact that he has since been offered \$500 an acre for his olive plantation.

Other citizens of Oroville were quickened to activity by this example, and an organization of the leading business men of that town was speedily effected. Thirty acres of good land were secured, two of the company went to Riverside and purchased two thousand one hundred Washington Navel trees, and during May and June these were planted on the north bank of the Feather River, in what is now the colony of Thermalito. The land cost them \$100 an acre, the trees were \$1 25 each, and to this must be added the expense of transportation and planting and caring for them during the intervening years. It will thus be seen that these gentlemen were not afraid to back their ideas and opinions of citrus culture with their coin. This grove has since been increased, and at present numbers

three thousand three hundred orange trees. They are now loaded with fast ripening fruit, and will this year yield a large and abundant crop.

Citrus fruit planting was by no means confined to Butte, but all the other counties of the Sacramento Valley felt the influence. A second citrus fair was held in the Capital City during December of 1886, two fairs thus being held in the same year, one in January and the other in the following December; and at that fair the fruit from twenty-two counties was shown.

These fairs and the liberal advertising by newspapers caused much attention to be paid to citrus fruit culture in Northern California, especially in the Sacramento Valley and its adjacent foothills, and it is that section only that I am attempting to present in this article. Trees were planted not only in the sheltered foothills and on high and well-drained land, but in the open valley and even along the low river bottoms—the very last place where an orange grove should be set. As a result of this movement, continued during the past three years, we have in the vicinity of Oroville, Thermalito, and Palermo, in eastern Butte, 98,349 orange, 6,812 lemon, and 49,600 olive trees, a total of 154,761 trees, or in round numbers about one thousand five hundred acres. The number of citrus trees planted in other Northern California counties I am unable to state with exactness, but know that Placer, Sacramento, Colusa, and Tehama have set out a large number, and that Yuba, in addition to her smaller tracts, has planted one splendid orchard of one hundred and thirty acres, or thirteen thousand orange trees in a single body. I believe it would not be unjust to the other counties in that section to estimate that Butte has planted as many citrus trees as all the other counties combined, which would then make three hundred and nine thousand trees, or three thousand acres devoted to the culture of citrus fruits in that part of the State.

It is unnecessary that I should go into particulars regarding the planting of orange trees, the manner of growing the young trees, budding and grafting, and other practical details of that kind. To one point, however, I will call particular attention. Hitherto all the young orange, olive, and lemon trees planted in that section have been brought from Southern California or from Florida. Now there are vast numbers of young trees being raised, and the future planting will be done with home-grown trees. In the vicinity of Oroville there is at least a half million young trees, from one to four years old, and there are large numbers of young trees at Palermo, Marysville, Chico, Auburn, and other places, that will, ere long, be set out in orchards, and thus will be largely extended citrus culture in that part of California.

The market for oranges is considered almost unlimited; on the north lie the great States of Oregon and Washington, with a population of six hundred thousand, while to the east lies a vast territory, a portion of which we may with confidence expect to supply with its citrus fruits. With these certain and ever increasing markets in view, the prospects for growing oranges and other citrus fruits in Northern California is an alluring one. The profits of those who have bearing trees are such as to encourage others who have planted out young orchards and now await their coming into bearing. So flattering are these prospects that during the present year a ten-acre tract of two-year old Navel orange trees at Thermalito sold for \$650 an acre. Sales at Palermo have also been extremely flattering.

If the citrus fruit outlook is now so attractive and brilliant, some may ask why this industry was not pushed ahead long ago, for orange trees have been bearing fruit in that part of the State for fully thirty years. May we ask in return, are there no other latent and undeveloped resources left to-day in that and other parts of our grand State? The olive flourished for four score years in Southern California ere the manufacture of oil by Mr. Cooper attracted general attention to that tree. Fig growing as a commercial enterprise is a comparatively new industry, yet it has been known for forty years that the fig flourished in all the warmer sections of California. Fifteen years ago California raisins were a rarity, while now our output is enormous, and rapidly increasing, yet the vine was known to flourish here in great perfection many years ere raisin making became a business. Cork is worthy of attention here. It is adapted to our soil and climate, and in Spain and Northern Africa immense fortunes have been made in cork—not corks—yet it is a neglected industry in our State. It is certain that money can be made in producing camphor, and that tree grows readily in all our warmer valleys, yet who thinks of planting camphor trees from which to make money? Why is it that we still import rhubarb from Southern Europe when it can so readily be produced here? There is money in licorice, yet that is among the neglected California industries. Our prune production has grown into a marvelous and gigantic enterprise, yet prune trees bore in this State long ere the fruit in any quantity was put upon the market.

Various reasons prevented the earlier planting of citrus fruits in Northern California upon a large scale, and one of these has been by too many overlooked. The orange and lemon have been most successful along the low foothills, as in Yuba, Placer, and Butte. The earth there is mostly a reddish clay soil, mixed with gravel, and which requires considerable water to make productive. Nearly all the water for irrigation in those localities was originally brought from the mountains for mining purposes, and was held at a high price. Now, until the general decline of mining, no man could afford to buy water for irrigating purposes, and from this cause more than any other may be traced the lack of planting citrus fruit trees. When mining declined, the price of water was lowered; men saw that they could afford to experiment, and they began to try various fruits, and to increase the number of their citrus trees. Another reason is the great expense in caring for an orange grove and bringing it to maturity. If the orange is king of fruits, it requires a royal revenue to pay the expenses during the time it is growing and coming into bearing. If to this we add the lack of knowledge regarding the cultivation of citrus fruits among the residents, and the further fact that many believe they could only be grown in sheltered and particular spots where the conditions were unusually favorable, the reason is fairly explained why citrus fruit culture was not sooner begun on an extensive scale.

The first citrus fair at Sacramento was the great awakening. When the fruits of twelve grand counties had been gathered and the productions carefully compared, it was seen that citrus culture extended over a far broader area than people had hitherto realized. The moment this fact was fully impressed upon their minds an almost instantaneous change was effected. It was like the traveler who emerges from the dark forest into the open sunlight of the broad valley, or like the view

presented from the top of a noble mountain when the earth at once grows to the mind tenfold larger than ever before. Vast and almost unlimited possibilities spread out before the residents of that region, and some of these bright visions they set about converting into living realities. Fully three hundred thousand orange, lemon, and olive trees now growing as green and thrifty as they do upon Sicily's bright isle, attest the belief and faith of the people of Northern California in citrus culture in the Northern Citrus Belt. In the single colony of Thermalito there are sixty-one different orchards, many of which are of citrus fruits. In the colony of Palermo there are sixty-five orchards containing 40,348 orange, 5,124 lemon, and 23,646 olive trees. Arrangements are already made to plant during the winter in eastern Butte fully five hundred additional acres to citrus fruits.

The essays, papers, and discussions before this honorable body have always been of the most practical character. Facts relating to the growth of fruit trees, to the best varieties of fruit, to the methods of pruning, the various styles of curing and packing fruit, the destruction of insect pests, and a hundred other useful points are yearly discussed. In presenting some facts upon citrus culture in Northern California I cannot go into these details, because this industry is yet immature and undeveloped.

The citrus trees are almost free from scale, there being none except in one or two localities. The varieties planted are mostly those that experience in the southern part of the State has shown are most likely to be successful. The young trees in nearly all localities are grown without any kind of protection. But little attention has so far been paid to pruning, and no washes or sprays have been used, except in one or two spots where scale has appeared. None so far in Butte County, which is the leading section. In the matter of grading, packing, and boxing citrus fruits no new or novel ideas have been developed. I have only been able to present general facts to you without those practical and useful details that have made the meetings of this honorable body of such great value to all the fruit growers of California. That a grand future opens before the northern part of this State as a citrus fruit region I am fully convinced, and ask your indulgence a moment longer in presenting some figures that may be of interest.

You are all aware that to grow citrus fruit successfully three climatic conditions must be fulfilled: The annual temperature must not be too low, the average temperature of winter must not be below 40 degrees, and the climate at no time during the winter so cold as to kill the trees. This lowest point may be placed at from 14 to 16 degrees, but for the best results it should not be lower than 18 or 20 degrees.

In order to present the claims of Northern California in a fair and candid manner, we have selected ten places in the citrus regions of Italy, and given the average annual temperature, the average winter temperature, and the lowest point the thermometer reached during the year. For convenience we have arranged these in tables:

LOCALITY.	Average Winter.	Average Annual.	Coldest.
Palermo	53°	63°	28°
Naples	48	61	23
Rome	48	60	19
Florence	44	58	12
Pisa	46	60	19
San Remo	48	60	25
Genoa	44	60	10
Mentone	49	61	23
Nice	48	59	26
Cannes	49	60	20

The average of these ten places for the winter is 47.7 degrees; for the year 60.2 degrees, and range of the lowest temperature is from 10 to 32 degrees. Taking the same data from ten localities in Southern California, the average for the winter, for the year, and of the lowest temperature, are as follows:

LOCALITY.	Average Winter.	Average Annual.	Coldest.
Colton	52°	64°	20°
Daggett	47	65	20
Santa Barbara	54	61	30
Los Angeles	58	60	23
San Diego	54	60	32
Newhall	48	60	18
Riverside	51	60	25
Poway	50	59	21
San Bernardino	49	60	-----
Spadra	54	64	28

These figures give the average winter temperature at 50 degrees, the average for the year at 60.5 degrees, and the lowest temperature of the winter at from 18 to 32 degrees.

Now, taking the same statistics for Northern California, and taking localities that fairly represent the whole Sacramento Valley without any selection for favored sections, we have:

LOCALITY.	Average Winter.	Average Annual.	Coldest.
Auburn	46°	59°	18°
Chico	47	64	20
Oroville	52	65	29
Orland	52	67	26
Williams	48	63	22
Knight's Landing	48	63	20
Sacramento	48	62	19
Redding	48	64	24
Red Bluff	47	62	22
Marysville	50	64	24

A recapitulation shows that the winter average for Europe is 47.7 degrees, for Southern California is 50 degrees, and for Northern California is 48.6 degrees; that the annual average for Europe is 60.2 degrees, for Southern California is 60.5, and for Northern California is 63.3 degrees. The lowest temperatures of the winter may be seen from the tables.

These figures are taken from the Signal Service records of the Government, and from other standard publications, and therefore should be

accepted as reliable and accurate; and upon the evidence of these figures we can see no reason why even the most prejudiced should hesitate in believing that Northern California will become famous as a citrus fruit region. We firmly, honestly, and sincerely believe that in years to come its low hills and extended valleys will become as noted for their fruits as its mountains have for their gold and its wide plains for their grain. It is true that the Almighty Creator in His infinite wisdom has wisely withheld from man the ability to foresee the future with certainty and precision. The Elijahs and Jeremiahs of old are no longer with us. That Supreme Being has, however, given us in thought, fancy, and supposition the power to rend aside the mystic veil that hides the morrow from to-day, and permitted us to picture to ourselves, in the roseate hues of hope, belief, and anticipation, what the coming years will bring to pass. And as we gaze with prophetic eye into the unnumbered cycles of time, when that land we have attempted to describe shall be enriched by the labors of ourselves and our children, we behold that vast region teeming with millions of happy, prosperous, and progressive people; a country made thrifty and productive by their enterprise and their energy; a land bright with fruits and gay with flowers; its foothill slopes covered with extensive, luxuriant, and profitable olive orchards, rivaling in extent and richness those of Italy and Greece; its broad and beautiful valleys dotted here and there with splendid groves of that noble tree, "laden with fairest fruit blossoms and fruit at once of golden hue;" its warm and sheltered nooks adorned with the continual blooming and ever-bearing lemon; far-spreading vineyards laden with grapes so large, sweet, and delicious that none but California soil could have produced them; magnificent fig trees lift their gigantic tops filled with rich and luscious fruit; lofty and towering date palms, of which the poet says:

"To man the palm is a gift divine
Wherein all uses of life combine,
House, and raiment, and food, and wine,"

Ornament the pleasing and fruitful landscape. And as we note the hill slopes adorned with noble forests of chestnuts and walnuts, and the valleys green with vineyards and fair orchards; orchards of pear, prune, apricot, and almond; orchards where peaches glow with sunny dyes, like maidens' cheeks when blushes rise; orchards where pomegranates, rich and sweet, show the print of the sunbeam's feet; orchards where on the grass land, on the fallow, drop the apples red and yellow, may we not apply the thought, if not the exact words of the poet, and say: "This is the land of the orange and vine, where the flowers ever blossom, the beams ever shine." A land so rich, bountiful, and prolific in the most favored fruits for man's use, that all within the borders of our grand and noble State will be proud of it. A region so promising, so hopeful, so assuring, and one in which we have such unbounded faith and confidence, that I would the power were given to us for a moment to sweep aside the dim, opaque, and mysterious curtain that hides futurity and permit us to see California, in all her splendor and crowning glories, as she is destined in reality to appear in all future ages.

FERTILIZATION OF ORCHARDS.

By E. W. HILGARD, Professor of Agriculture and Chemistry, State University, Berkeley.

The subject I wish to bring before you rather briefly, not in a set lecture, but rather in the way in which I like to present such things, and ask you if you desire, to interrupt me and ask questions, is the subject especially of fertilization of orchards. Fertilization is usually a late outcome of civilization in this country. I remember well when I was in charge of the Horticultural Department at the University of Mississippi, that when fertilization was mentioned the usual remark was: "Fertilization is too troublesome, and will never pay." We have learned better since, and it is a great source of gratification that we find in California, long before the State has acquired the age that Mississippi had at that time, that fertilization is beginning to attract great attention. Something is due, perhaps, to the nature of the cultures that are prominent in California. You know that when field crops are cultivated the practice usually is to have some routine, and even the backwoodsman in the Southern or Western States knows that in order to get a good crop of corn he must not plant it to follow other crops of corn, but to put something between them. Now, our wheat planting has in this State progressed to the extent of reducing the first product of about forty bushels to the acre, and in some cases as much as eighty bushels I am told, to an average of about fifteen. That has been done by the consecutive planting of wheat after wheat, and therefore a one-sided use of the land. Where rotation of crops is practiced the use is made much more uniform, as it were, at all points of the soil composition; whereas, where one crop is planted continuously the soil is used up, as it were, on one side, or perhaps two sides, but not on all the sides which it presents to the crop. Now, fruit growing, which is bound to be the prominent industry of California, is necessarily exempt from the possibility of rotation. An orchard and a vineyard are permanent investments which we expect to last, if we know how to manage them, from twenty to forty years. Forty years is not an unreasonable age to expect from vines in particular; we have now vines which are older than that in the State, and there is no reason why a vineyard should not last forty years and over, provided it is properly treated, and has been planted in the right place. Now, then, your crops from that vineyard or from that orchard are constantly one and the same thing; you are withdrawn, as it were, from the possibility of rotation, and hence your land is used up in a one-sided manner, and of course the need of fertilization makes itself felt all the sooner. I am constantly in receipt of letters asking me to recommend what fertilizers to use. Now, the question is a little embarrassing, because while we do know at what points certain crops do use the soil particularly, soils differ so widely in this State and everywhere, and the practice of culture varies so much, that it is not easy to give a general answer to such questions; and to answer each individual farmer who asks those questions is getting to be rather irksome business. I have written during the past year not less than between seven and eight hundred letters on just such subjects, and it occupies a great deal of my time, and I am therefore glad to have an opportunity of saying and giving to a wider publicity a little of what I might say to each one in reply to those numerous letters.

The understanding of the principles upon which the cheapest, and, therefore, the most rational method of fertilization may be based, to a certain extent involve the ingredients which compose the fertilizer. Now, to the chemist these ingredients are generally very well known. The farmer generally hesitates when such names as phosphoric acid, and potash, and nitrogen are mentioned before him; but the farmer must understand distinctly that he cannot avail himself of the aid of science in his pursuit unless he does take pains to understand these so-called "jaw-breakers," and, after all, there are a great many names which are worse. Electricity is a very hard word to pronounce, although you talk of it, and "telegraph" and "telegram" don't come very hard; and therefore not only the word, but the idea of potash, phosphoric acid, and nitrogen ought not to come hard after you once understand it. I lately read a report from one of the Eastern States that the farmers, I think it was in Massachusetts, now talk just as freely about these substances as they do about birds, or dogs, or anything else—and there is no reason why they should not—and you can illustrate the substances very well by reference to articles that there is no difficulty about.

Now, then, to go a little into this matter, all fertilizers that we use, that are furnished cheaply, contain one or several of all of these three substances: Potash, represented by the potashes of commerce; phosphoric acid, represented most readily to you by either the matches of every-day life, or, better, by the bones of animals; and, finally, nitrogen, which is represented in a great variety of ways; probably the most familiar representation of it would be as a large component of the air, which is certainly sufficiently familiar; but to the farmer the source from which he replenishes the soil for the use of the crop is usually one of two things, either ammonia salts or niter—nitrates of some kind—at the present time chiefly the nitrate of soda, which comes to us principally from Chile, under the name of Chile saltpeter. I mention these sources of the ingredients because it is this that we must consider in getting our cheapest supply of fertilizers. There is another substance which it is very essential to have in the soil, and which, if it is not in the soil should be given to it, and that is lime; but our California climate has so managed the soil-making processes, and our rocks are so constituted, that there are very few soils in California that do not contain as much lime as is wanted, and for which there are uses; and lime is always an important agricultural ingredient, yet to put lime in the soil in California is usually like "carrying coals to Newcastle"—it is not needed.

Some time ago, at one of your mountain places here in Santa Cruz, there was a factory established to grind limestone, and they wanted me to tell them where it should be applied, and I told them that if they shipped it outside of California they would probably find they could use it, but inside of California there was probably limestone enough in the soil, and they would have to ship it a distance away from the Santa Cruz Mountains to have any use for it. Therefore, we have this advantage: that our soils are already provided with one of the very important ingredients which, in the Eastern States, is most frequently one of the sources of infertility. I can give you a general idea of this: Take the soils of the Southern States, for example; you are competitors in some respects, but place the average of lime in their soils at something like two tenths of one per cent—I should place the average of California

soils at between $1\frac{1}{2}$ and 2 per cent, so you see we have a long ways the advantage of them in that regard. Taking that for granted, now we are usually aiming to supply one if not two of the three ingredients, potash, phosphoric acid, and nitrogen—what I just now said in reference to lime in California soils, investigations, so far as they have gone—and they have not extended very far north of Sacramento, because people there have not asked for it—we of course do our work just where it is asked for—have shown that in the vast majority of California soils potash is not an ingredient that need be supplied at the present time; it is so abundant in the large majority of soils that when the soil fails to produce what you want, the presumption is not that potash is lacking, but that either nitrogen or phosphoric acid has given out, if the soil is otherwise in good condition. Now, this conclusion is the result of several hundred examinations of California soils which have been made at the central station at Berkeley. We are constantly extending our knowledge in the different parts of the State, and so far I have no reason to think otherwise than that there is, on the whole, a sufficient supply of potash for the present generation, and probably for another generation to come, in our soils. We are, therefore, freed, in a great measure, at least, from looking out for that ingredient furnishing the soil with potash, and phosphoric acid and nitrogen are the two that chiefly occupy our attention.

Now, for a moment go to the principles of fertilization. If from the moment that you start to cultivate the land you were to return annually whatever your crops take away, the land would not only not become poorer, but they would steadily improve. For instance, if you were to sow wheat this year and each year plow the wheat under without taking the grain away, your land would continually increase its production and you would get more wheat every year, but of course you would make no money out of it; you would have your labor for nothing. Now, with wheat you take your grain away in the place of the plant; with crops of potatoes or parsnips you take the roots away; in other cases you take the leaf. It is generally true that if you are to take the whole plant, it makes very little difference which plant, the kind of ingredients taken would not differ very widely, and the difference in the manner in which the crops use the soil, therefore, is dependent chiefly upon the part that you take away. If you take away chiefly seed, the two ingredients that are drawn upon mainly are phosphoric acid and nitrogen. If you take away chiefly the root, or only the root, the ingredient usually drawn upon is potash; other salts will be drawn upon, but the potash is the permanent ingredient. If the leaf is chiefly drawn upon, all of these ingredients to a less or greater extent, and lime, are heavily drawn upon.

Now, then, what you want to do is to put those things back again, and I repeat, if you were to do that from the beginning—and it would be a very judicious thing to do, to keep an account of your soil just as you keep any other account, debit and credit account—if you were to keep an account of your soil from the beginning, and return each year the trifling amount that you take away in your crop, why your soil would never get any worse; on the contrary, it would keep improving its production, but it would require the spending of a little cash, and the man who clears a piece of land of course does not want to do that as long as his soil produces. Then he comes to a point when his crops begin to

decrease in quality and quantity, and now comes the question as to which is the fertilizer that is to be used. Knowing nothing about it particularly, we would say take that which contains everything, namely: stable manure. That is very good advice to give if you can get plenty of stable manure. There is no use of this discussion as long as you can get plenty of stable manure, but to do that is just precisely where the shoe pinches. The old country has been trying to get enough stable manure in some way or another and it has failed, and its farmers are importing their fertilizers from South America and North America and all the countries of the world, because sufficient stable manure cannot be had. And why is that such a universal fertilizer? Because it contains everything that is taken from the soil, and therefore gives it back to the soil. Now, you might say: Why should we not imitate stable manure artificially; why not give back to the soil everything at once—potash, phosphoric acid, and nitrogen? Because if you give them something that is not wanted, you spend something unnecessarily; you are "carrying coals to Newcastle," as in giving lime to California soil you will do; as in giving potash to the soil in the San Joaquin Valley, you would only make alkali worse than it is already. You want to spend as little as possible and to make return to the soil what has been taken from it, and if it has been used in a one-sided fashion, it may be that the return of one ingredient alone will be quite sufficient. Of course the composition of the crops you have taken off gives you a clue from the very beginning, and as this composition is known and can be given you in tabulated form, you can really calculate for yourself just what is necessary to be given back. I published a bulletin not long ago in which this matter was set forth. I have brought a few for you to take, and you will find a table which shows you how much of these three ingredients is taken away by a thousand pounds of grapes, or oranges, or plums, or apples, and so I might go on down through the whole list of crops. By this you will see just how much you would have to put back for each year you have had a certain crop—the simplest thing in the world—and if you have not done that, and very few have, the question is, what must you supply?

[The following bulletin was ordered inserted in Professor Hilgard's remarks by the Board:]

THE USE OF FERTILIZERS IN CALIFORNIA.

(*University Bulletin No. 88.*)

The fortieth anniversary of the admission of California into the Union reminds us that she has ceased to be a stripling. With this advance in dignity comes the inference that however fertile her soils, it is to be expected that those long occupied or heavily cropped will now require serious care in order to keep up or restore production. That this is really so is proved by the rapidly increasing correspondence on the subject that is addressed to this station; and to avoid the unnecessary rehearsal of general statements in each individual case, it seems desirable to put in print for general information what can be stated in a general way on this subject. Of course many individual cases will still require special consideration on account of peculiar conditions of soil or location; for in a great many instances the failure to produce satisfactory crops is not at all due to soil exhaustion, but to improper physical conditions of the subsoils, unsuitable cultivation or irrigation, alkali, etc. The fact that orchards and vineyards form costly investments of much greater permanence than the annual crops that occupy the vast majority of the cultivated land east of the Rocky Mountains, and the high returns so often realized from them, has brought the manure question forward here much earlier than has usually been the case in the United States; and happily the silly adage that "manuring is too costly and will never pay," which has long kept agriculture on the down grade elsewhere, has never had a serious foothold in California. The sovereign truth that nothing pays worse than poor crops, upon large areas of which the cultivation costs just as much as if it were

yielding high returns, is quite generally appreciated here. Cultivating too much land poorly, and getting poor returns both as to quantity and quality, has been the bane of farmers all over the East, and has doubtless done at least as much toward "agricultural depression" as all other causes combined.

But whether fertilization will pay or not clearly depends directly upon the particular requirements of each soil. Unlike Europe, where long cropping has reduced all soils alike to a condition when they require an "all-around" fertilizer, the soils of California have mostly had only a *one-sided wear* from the constant succession of one and the same crop. In orchards and vineyards this state of things is unavoidable, since they are expected to last twenty to forty years without renewal and possibility of rotation of crops. It is this one-sided wear, inseparable from the chief horticultural industries of the State, that requires special attention at this time; for it is clear that to apply "complete" fertilizers in these cases would be to pay out a portion of their cost uselessly, since nothing can be gained by adding to the soil more of the ingredients that are already abundantly present in an available form.

In order to fertilize intelligently we must know, first of all, what ingredients are chiefly drawn upon by the crop sold off the land; secondly, we must know which of these ingredients are so abundantly present in the soil (or irrigation water, as the case may be), to render their replacement unnecessary for the present at least.

The subjoined table* gives some insight into the amounts removed from the soil by some of the chief fruit crops, of nitrogen, potash, phosphoric acid, and lime; these being, according to all experience, the only ones of which the replacement need ordinarily be considered in fertilization. These amounts are expressed both with reference to one thousand pounds of fresh fruit, and to what, according to our best information, may be assumed to be a "fair crop" per acre. The latter figure is, of course, liable to great variations and differences of opinion; but by the aid of a little arithmetic each one can calculate for himself the data suitable to his own case or views. The crop assumed in the case of oranges is three hundred and twenty-five boxes per acre of fifteen-year old trees; that of grapes is intended to represent a mean between upland and lowland.

Quantities of Soil Ingredients Withdrawn by Various Fruit Crops.

FRESH FRUIT.	Total Ash— lbs.	Potash—lbs.	Phosphoric Acid—lbs.	Nitrogen— lbs.
Grapes, 1,000 pounds.....	8.80	5.00	1.52	1.70
Crop of 10,000 pounds per acre	-----	50.00	15.20	17.00
Oranges (seedless), 1,000 pounds	6.07	2.78	.67	2.69
Crop of 20,000 pounds per acre	-----	55.60	13.40	53.80
Pears, 1,000 pounds	3.30	1.80	.50	.60
Crop of 20,000 pounds per acre	-----	36.00	10.00	12.00
Plums, 1,000 pounds	2.90	1.72	.44	4.20
Crop of 80,000 pounds per acre	-----	51.60	13.20	167.70
Apples, 1,000 pounds.....	2.20	.80	.03	.60
Crop of 20,000 pounds per acre	-----	16.00	6.00	12.00

It will be seen that for equal weights of these fruits, *grapes* take from the soil by far the largest amount of mineral matter, of which nearly five ninths is potash; they also carry off the largest amount of phosphoric acid. For seedless grapes the latter item would, however, be considerably smaller.

Next in the drain of total mineral matter from the soil stands the *orange*; it also draws heavily on the potash, and also upon the nitrogen of the soil, but less than the grape upon phosphoric acid. This, independently of the seeds, the analysis having been referred to seedless fruit; seed-bearing (seedling) fruit would draw more heavily both on phosphoric acid and nitrogen.

Pears come next, as regards total mineral matter, but draw quite lightly on nitrogen.

Plums (including prunes) are conspicuous chiefly for their heavy draught on the nitrogen of the soil, greatly exceeding in that respect the orange, for equal weights, and enormously for an (assumed) average crop.

The difference between *apples* and *pears*, in respect to soil exhaustion, for an equal weight of fruit, is quite striking—the amount of potash in apples being less than half, the phosphoric acid only a trifle over half as much as in the pear, while nitrogen is equal in both, and quite low, as compared to the orange, which has over four times as much, and must, therefore, be accounted relatively much more nourishing to man, as well as more exhausting to the soil.

While the data given above in relation to the "out-go" of soil ingredients through the harvesting of the several fruits may be considered as holding good, practically, in all countries and on all soils, the vast differences in the nature and composition of *different soils* introduce an element of uncertainty as to the need of returning to every soil the full

* The analyses of ashes here given are mostly those of European chemists, generally accepted as representing averages. California-grown fruits will be investigated at this Station the coming season for this purpose.

amount of the outgoing ingredients. Few soils are about evenly constituted with respect to the four important plant-food substances; there is in most cases one or several of these present in superabundance, so that to replace the small amount carried off by the crop would be as useless as "carrying coals to Newcastle," at least for the present. *The analysis of soils and irrigation waters is necessary to gain information on these points.*

As regards waters, the information so obtained is positive and unimpeachable. Whatever is dissolved in the irrigation water is absolutely available to vegetation, and the amount annually so conveyed to the soil is capable of close calculation on the basis of the current practice of each irrigation district. If the amount of any substance so given to the soil approximates to or exceeds the amount withdrawn by crops, it is quite certain that no moneys need be expended in the purchase of that particular substance as a fertilizer.

As regards soils, the indications given by chemical analysis are not so definite, because the acids used in the laboratory are more powerful than those at the command of the roots of plants; although some of the latter (*e. g.*, oxalic acid, that of sorrel, rhubarb, etc.) approximate closely to the same solvent power. Here experience must be our main guide; and this has shown that practically soils containing (by the results of analysis) more than a certain percentage of a given substance, may be considered as abundantly supplied with the same; while if the percentage so indicated falls below a certain other point, such ingredient may be considered as being deficient. The crucial test in either case is the experimental use of that substance as a fertilizer on the soil in question; when if it fails to produce a definite favorable result, it may be considered that the native supply is sufficient, and *vice versa*.

It is obvious that in order to secure to the farmer this saving of the purchase of superfluous fertilizing ingredients, a comprehensive system of investigation of soils and waters is necessary. This has been from the outset the central thread of the work of this Station, the object being to obtain as quickly as possible the facts necessary for the compilation of a soil map of the State. For want of funds for field work, and too limited a force for the laboratory work, this fundamental plan has been carried out only to a limited extent and chiefly in certain regions where considerable interest in agricultural improvement was manifested. We are not, therefore, as yet prepared to give information as to the entire State; and unless some special provision is made, it will be long before this can be the case. But so far as the work has gone, the following points may be considered as practically settled:

1. From climatic as well as geological causes, nearly all the soils of the State may be considered as abundantly supplied with *lime*. The chief exceptions occur in the higher portions of the foothills, where the rainfall is high and summer rains occur. In *all* the valley soils lime is abundant; and liming is therefore not among the means of improvement usually to be thought of in California. This applies to the use of quicklime and ground limestone, not necessarily to the use of marls, which usually contain other ingredients besides lime to render their use valuable, where it can be done with little cost.

2. Almost the same that is stated above of lime may be said of *potash*. The great majority of soils in this State, more especially nearly all valley soils, and absolutely *all* soils in which there is the least manifestation of alkali, contain an abundance of available potash for all agricultural purposes; so much so that dissolved potash salts frequently circulate in the soil water. Most irrigation waters furnish an additional supply, sometimes enough of itself to make up for all that crops take away. Outside of the rainy belts of the Sierra and of the northwest coast, therefore, the addition of potash in fertilization must in general be considered in the light of "carrying coals to Newcastle"—superfluous and unprofitable at the present time; and farmers should object to paying for the potash in commercial fertilizers (put there under the Eastern idea of making a "complete" fertilizer), because the investment will pay them no interest. They should demand for their money the ingredients that will pay them for their use in this State, regardless of what may pay elsewhere.

The few cases in which at present the use of potash *will* pay, are those of intense culture in vegetable gardens and berry patches, where crops are grown continuously and successively throughout the season. Here the draught upon the soil ingredients is so heavy that within a few years *all* require current replacement.

3. Of *phosphoric acid*, an ingredient so important that even in Europe it is beginning to be claimed as the practical measure of fertility, analysis has shown an almost universal *scarcity* in the soils of this State; always excepting the alkali soils, in which it, or its compounds, frequently circulate in proportionally large amounts. Phosphoric acid is one of the substances to be first suspected of exhaustion in the non-alkaline soils of California; it is, therefore, an ingredient that should be prominent in *all* compound commercial fertilizers, and which will be found to "pay" in most cases of decreasing production.

4. As to the fourth of the critical soil and plant ingredients, *nitrogen*, its ordinary measure in soils is the vegetable mold or humus, the presence of which is generally manifested, and outside of "red" soils is fairly measured, by the more or less blackish tint when wetted. From climatic causes humus is rarely abundant in the upland soils of the State, and very generally its amounts may be said to be small. This is especially true of the mesa soils of the South—those best adapted to the growth of the citrus fruits—and hence it is reasonable to suppose that a *lack of nitrogen* will be among the first things to be apprehended when that fruit shrinks in size, and production fails on these soils.

Elsewhere stable manure is the ordinary source of this as well as of the other substances when required only in moderate amounts; but for many reasons stable manure is less available in the dry climate of California than elsewhere. It is produced only in small quantity in horticultural communities; and when put in the soil it is long in decaying and becoming effective. It should for our climates be systematically "cured" in the manure pile before being used—a point of vantage which explains, in part, the good effects of sheep-corral manure.

By far the most convenient, and at present certainly the cheapest and most available source of nitrogen at command of the farmer, is *Chile saltpeter*, which contains about 16 per cent of nitrogen in its most effective form. From one hundred and fifty to two hundred pounds per acre is the usual dose; more than this will not be used by the crop plants in one season, and a surplus is likely to be washed out of the soil by the winter rains. Moreover, an excessive application might result in too much wood and too little fruit, and that fruit of a sappy, flavorless character, though of large size.

Sulphate of ammonia is the other most available source of nitrogen obtainable in commerce; a good commercial article contains 20 per cent and over of nitrogen. It does not, however, act quite as rapidly as the Chile saltpeter.

To the citrus growers, then, who at present appear to be most concerned about the fertilizer question, I would say that, well-cured stable and sheep-corral manure apart, their best resort at present is to the commercial phosphates and superphosphates of high and honest grade, mixed, either by themselves or by the manufacturer, with a proper proportion of Chile saltpeter or ammonia sulphate, and generally no potash whatever.

In order to cover approximately the ground of the questions most commonly propounded in our correspondence on the subject of fertilizers, the following points are briefly stated:

This Station has no direct or definite knowledge of the quality or "trueness to name" of any of the commercial fertilizers now sold in this State. Analyses of mere samples sent by the manufacturers or others prove little or nothing, so long as no regular "fertilizer control" is established by State authority. That this should be done as soon as possible, in the interest both of the users and honest manufacturers of fertilizers, is manifest; and nearly all the older States have found this regulation of the fertilizer trade necessary long ago. At present this Station declines to analyze and certify to the composition of fertilizer samples, except in cases of suspected fraud; for the reason that such samples prove nothing as to the general quality of the material put on the market, and their analyses have been used in advertising as though offering a kind of guarantee or recommendation on the part of the Director. The latter disclaims pointedly any such responsibility, and does not authorize the use of his name in connection with any fertilizer advertised. He has, however, no reason to question the *bona fide* character of the several fertilizers manufactured in this State. That in individual cases disappointment must often occur, is natural from the causes stated above, and proves nothing against the honest composition of the goods. In this, as in other cases, the right thing may be put in the wrong place. The useless addition of considerable potash is the objection lying against several of the brands in the market.

Farmers should be willing to pay a good price for a high-grade fertilizer, especially in the case of superphosphates. The only consequence of insisting on too low a price is that the manufacturer, in self-defense, adds to the active matters enough of some cheap, inert material to be able to afford the lower rate; the result being that the farmer pays freight, to say the least, on "dirt" which he might as well put in himself on the spot, if so inclined. "Spent refinery charcoal" in coarse grain is about as unprofitable an investment as a farmer can well make; he should be willing to pay enough to justify the manufacturer in reducing every grain of it to the soluble form by the use of enough sulphuric acid. It is not advisable for any one to attempt to do this at home.

In regard to the use of *bones*, it may be said that any one may, with little trouble, use all the bones accumulating about a homestead in either of three ways:

1. Bones put into a *well-kept* (moistened) *manure pile* will themselves gradually decay and disappear, enriching the manure to that extent.

2. Raw bones may be bodily *buried in the soil* around the trees; if placed at a sufficient depth, beyond the reach of the summer's heat and drought, the rootlets will cluster around each piece, and in the course of a few years consume it entirely. But it will not do to have these root-clusters broken up by cultivation every season.

3. Bones may be packed in moist wood ashes, best mixed with a little quicklime, the mass kept moist but never dripping. In a few months the hardest bones will be reduced to a fine mush, which is as effectual as superphosphate. "Concentrated lye" and soil may be used instead of ashes. In this process the *nitrogen* of the bones is lost, going off in the form of ammonia, the odor of which is very perceptible in the tank used.

For neither of these processes should the bones be *burnt*. The burning of bones is an unqualified detriment to their effectiveness, which can only be undone by the use of sulphuric acid.

4. Bones *steamed* for three or four hours in a boiler under a pressure of thirty-five to fifty pounds, can, after drying, be readily crushed in an ordinary barley-crushing mill, and thus be rendered more convenient for use. Practically very little of the nitrogen (glue) of the bones need be thus lost.

Very good *bone-meal* is found in the market at reasonable rates.

For information concerning the value and proper uses of *land plaster* or *gypsum* (also one of the inquiries continually made), I refer to pages 144 and 145 of the "Report on the Experiment Stations," lately issued, which will be mailed free to any one desiring it. It

may here simply be stated that while gypsum is not a general fertilizer like the phosphates and nitrates, for the simple reason that it does not contain, and therefore cannot supply, the plant-food substances of which the withdrawal by crops causes sterility; yet its uses, especially in the irrigated regions and on alkali soil, are so many and so important, that it should be very widely used so soon as a reasonably cheap supply can be obtained.

One of my objects to-day is to give you some idea of how you can get at it. In the first place you have fertilizers offered you as complete fertilizers in this State, nearly all containing potash, and of course you would put them off; now, seeing that very few of you will need any potash—and why should you pay for what you do not need—the fertilizers for this State, at the present time at least, should contain, in the main, nitrogen and phosphoric acid, and these two you have reason to pay for, and the rest you don't have reason to pay for. Of course you have to trust in that regard the representations of the manufacturer or the vender of the fertilizers. We understand pretty well what are the specific effects of the substances, and all the information I can give you is to come to your own conclusions in regard to the possible deficiency that causes a diminution of your crop, because, unless your crop has diminished, of course you have no call at all for phosphoric acid; when the deficiency in the soil, generally speaking, causes a failure to fruit in this, that there is a deficiency to set or that the fruit is small, while it may be numerous, and when the fruit is small and fails to develop properly, and especially has a great many unsound kernels, the reason is that phosphoric acid is one of the chief ingredients necessary in the formation of seed, and without it seed cannot be formed. I had a case reported to me from the foothills of Santa Cruz, on the other side, some time ago; an orchard of prunes which produced very large crops for some time, and still produced a very large number of prunes, but they were too small to be salable. Now, in this case the seeds were perfect; what was lacking was the flesh. Clearly it was not in that case the phosphoric acid that was lacking, because from the formation of the seed evidently there was an abundance; it was something else that was lacking; that substance is not phosphoric acid, but nitrogen and potash, and in that case I advised immediate use of Chile saltpeter or sheep manure if it could be had. I do not know exactly what the result was, it has not yet been reported to me, but I have no doubt the application in that case of Chile saltpeter would produce precisely the effect wanted, without diminishing the number of the fruit to increase the size, or perhaps diminish the number of the fruit somewhat and increase the size of each one, which is what you want. The effect, then, of a lack of nitrogen in the soil would be, if there was plenty of phosphoric acid, to increase the size of the fruit, while the fruit was still setting, but when it blooms abundantly and fails to set you may conclude that there is a deficiency of phosphoric acid, and then is the time to buy it.

From Southern California I hear that oranges have been produced in great abundance, and of large size, for a certain period, and all at once the oranges begin to diminish in size, and they get dry. Now, in the case of oranges, this table will show you just what they consume: Seedless oranges would consume, in 1,000 pounds of fruit, 2½ pounds of potash, a little over a half a pound of phosphoric acid, and 2.7 pounds of nitrogen. You see, oranges bear substantially on potash and nitrogen, and phosphoric acid is not needed. Why? Because we speak of seedless oranges—the seedless Navel drawing mainly on the two ingre-

dients. If, on the contrary, you have oranges which usually have plenty of seeds, a little more would be required of the phosphoric acid; still, when you sum up a crop per acre of 20,000 pounds, which is what is claimed by the authorities down south, you will have 55½ pounds of potash, 13½ pounds of phosphoric acid, and 53.8 pounds of nitrogen. Now compare that with what would be taken away by a crop of prunes. I have had very great difficulty in coming to any conclusion, because the figures given me vary all the way from 150 to 1,000 pounds of the average crop per tree, and I have put it as a crop of 30,000 per acre as something that might be agreed upon between the San Joaquin Valley on the one hand and the Santa Clara Valley on the other. I don't swear to that, but if you were to compare crops of equal size, equal magnitude, the prunes would take away, instead of the 53 or 54 pounds that oranges do, 167 pounds of nitrogen—nearly three times as much—while in the matter of potash they come very nearly to the same point. Now, I shall not bother you more with figures of that kind, because those are things which cannot be properly dealt with in a mere lecture. You ought then, as a regular rule, to keep account of your soil—what you do draw from it, on the basis of the well-known composition of crops—and by that you will be able to base some idea of what is lacking, and you may, by experiments on a small scale, soon find out whether it is so or not. For instance, you need not use Chile saltpeter by the ton; if the size of your fruit is decreased, use it on half a dozen trees.

Now, I have been told that it is desired I should give you some idea of the manner of using these things, and the reason I speak of the specific giving of these substances is simply this: there is here, in this State, no control of fertilizers. In all the Eastern States there is a State control of fertilizers, and they do not permit the sale of fertilizers before they have been inspected, an analysis made, and a certificate issued by the inspector or chemist. Without that, it is found that the fertilizer trade is entirely too tricky to be of permanent good to the country, and while I believe that most of the fertilizers now sold in California are of good quality and as represented, yet I think that until State control of fertilizers is established it will be better for the farmers who want to know exactly what they give their land to adhere to fewer materials that they can get in the market; and for nitrogen, which is one of the most essential to be used, Chile saltpeter is a substance which never changes in composition; it contains about 15½ or 16 per cent of nitrogen, and upon that you can always count, and an application of that to the soil would be at the rate of about one hundred and fifty pounds to the acre; not very much, you see. It will cost you at wholesale at this time, I imagine, about 2¼ cents a pound, and in the general form in which it is used you must not use it before the winter rains, because it washes all through the soil; you must use it at the time when it is wanted, in the spring, prior to the leaf coming out, but still not when you expect rain enough to wash it through the soil. In regard to those who use it with irrigation, they must be careful to give their irrigation before using it, and then simply irrigate it in after the need of very heavy irrigation is over, because it is a substance which does not stay in the soil very long, and what you put in as a surplus one year is lost the next year, and there is no justification for putting in more than just what is wanted for the crop, and that is, to repeat, about an average

of one hundred and fifty pounds an acre—sometimes one hundred will do and sometimes two hundred is desirable; that you can find out afterwards. Now, Chile saltpeter is an ingredient in many of the commercial fertilizers, but you never know how much there is without an analysis is made. Probably the analysis given here is correct, but still you would want to know exactly what you get when you purchase that substance.

For phosphoric acid the substance you can always use is bones in some form, bone-meal. Bone-meal is so easily tested as to its purity by the eye, by any one who is willing to use his eyes, that very little deception can be practiced with it. You can increase its efficacy by mixing it with stable manure; but, put in by itself, it is exceedingly effectual, and it stays in the soil almost indefinitely; in other words, in two years until used. In regard to the use of bones, there are many ways in which you can use them without grinding—without paying anything for making them smaller. The way I do in my own place is simply to get them into the ground there alongside of the trees; the trees take care of them. If you put them in the ground about twelve inches you will find by the end of the season that they are completely decomposed; the bone is completely covered by a network of roots, and you must not dig up that network of roots with the plow every year; you must put it down out of the reach of the plow, and in three or four years that bone will be completely taken up by the tree. Or you may place the bone, if you have time, in your manure pile; in the course of a year, or sometimes six months, or sometimes three, depending upon how you keep the pile, the bone will disintegrate and you will see nothing more of it. It enriches and forms part of the manure.

Again, you may put a bone with common ashes into a tank and leave it there; simply moisten the ashes, and in the course of several months it will be reduced to a mush, and that mush is as good as any phosphate fertilizer you can possibly buy. It is in an exceedingly fine state, and is almost as effectual as any superphosphate of commerce you can purchase. These are means by which you can utilize your bones, and as soon as there is a general demand for these fertilizers the home supply of bones becomes insufficient; you must then resort to the superphosphates of commerce, and there is where I think the State must take action, as quickly as possible, to get such supervision as will insure the farmer getting what he pays for; for while the honesty of many of our houses is unquestioned (I believe fully that they mean what they say they do), yet I have been led to refuse absolutely to analyze any of these fertilizers for any of these houses for the simple reason that my signature has been taken as a kind of guarantee of what the material is supposed to contain. Now, when they send me a sample to analyze it, I cannot vouch for what the next sample will be, and yet I have received complaints that the fertilizer did not act as it should according to the analysis which was certified to by me. Now, the purchaser ought to have known better than to suppose that because I said that I had analyzed a sample sent to me by such and such a house, that therefore I guarantee the composition of their goods; but still, inasmuch as it has been done, I simply have declined to sign my name to anything of the kind. When people have come to me—consumers—to determine whether or not a fertilizer is misrepresented, why, I have made the tests, but I will not put my name to certify to anything until a State control establishes that the signature can mean something by which there can be no mis-

take. I think those who are interested in fertilizers ought to try and get the next Legislature to establish that which is now established in nearly all the Eastern States. There are only a few States now east of the Mississippi that do not have State control; it is found to be a necessity and ought to be established here.

Now, I do not know that I shall detain you longer with a general discussion of this kind. I would rather that those who desire to know more about it should ask such questions as they may wish to ask with reference to their particular position; but I will add this: I have said before that one of the advantages of our soils is that they contain nitrogen, two of the ingredients which are important to all the soils, namely: lime and potash, and I should add to that that a great many of our irrigation waters contain potash, and each time you give it a year's irrigation you supply enough potash to supply any ordinary crop; some of the irrigation waters of Southern California are fully up to that standard. The ordinary Riverside irrigation water would contain in an ordinary year's irrigation three fourths of the amount of potash that is consumed by the orange crop. The advantage of this to the cultivator is obvious; he gets not only his water, but he gets a considerable amount of fertilizer with it, and it makes quite a difference to him whether or not he irrigates with rain water, or with water that is worth perhaps \$4 or \$5 in the way of fertilizers. A good many of our irrigation waters are of the same character, and it is one of the advantages of irrigation that nearly all the waters of California bring with them a very notable amount of such fertilization. That is one reason why irrigated lands hold out longer than the others.

DISCUSSION ON FERTILIZING.

MR. BLANCHARD: I would like to ask Professor Hilgard how the lemon compares with the orange in the ingredients that it takes from the soil?

MR. HILGARD: So far as I have known, these things have not been as fully investigated as desired, but there is probably no great difference between oranges and lemons except this: that the lemons always contain plenty of seeds, and therefore draw more heavily on phosphoric acid than the orange. It is not probable that there is any essential difference between the two.

QUESTION: Do you recommend putting lime on heavy soil, or where it is inclined to be a little adobe?

MR. HILGARD: Well, the black adobe, the dark-colored adobe, usually contains as much lime, a good deal more than you can put on it with any reasonable expense. I can speak of my own vineyard at Mission San José, which is partially, I am sorry to say, black adobe, and which I have analyzed; it contains no less than 3 per cent of lime. Now, if I were to try to put that on the soil it would probably cost me a good deal more than the land is worth, and what I could add to this would be a fraction, say one tenth of one per cent, which, in fact, would amount to nothing—it would be carrying coals to Newcastle. With the white adobe it is quite a different thing, and often the lime is deficient and an addition to it would be advantageous. Of course mere gener-

alizations will not hold good in every case; there are cases where lime is deficient even in California, but they are few and far between.

MR. MOSHER: In some of this black adobe we find a good deal of clover, much more than others; would there be more lime in one than in another?

MR. HILGARD: Clover generally signifies plenty of lime, and where you find that the clover suddenly ceases and refuses to grow, you will generally find a benefit from the use of lime. You find that the instance where you take tule land, which is usually acid; as quick as you put lime on it clover will spring up naturally; but in the East, where generally lime is scarce, if you find clover growing abundantly you find usually a calcareous soil.

MR. MOSHER: I ask that because in our county (Santa Clara) there is a good deal of rich, dark soil, and it is near enough to get plenty of this soft lime for almost nothing, and there are a great many people in our neighborhood who would like to know in regard to that.

MR. HILGARD: You will frequently find that the use of this natural lime—this marl—is efficient, not because of the lime it will carry, but other things. A good deal of this Santa Cruz limestone carries a good deal of phosphoric acid and other things, even potash, which is desirable; so that these marls are useful, not for lime alone, but for something else. As a rule, the black adobe is so full of lime that very little good can be done by the use of marl.

MR. BERWICK: We had some discussion as to the use of copperas as an insecticide around trees. How much could be safely used in the ground to kill the woolly aphis around the trees?

MR. HILGARD: It is hard to say without knowing something about the soil. In a sandy soil you must use very much less than in a clay soil.

MR. BERWICK: How much copperas would poison the tree as well as the insect—a stout, vigorous tree, ten years old?

MR. HILGARD: That is a hard question to answer. It would depend upon the concentration of the solution. You could doubtless put three or four pounds around the tree, if you scatter it well, without hurting it materially, because it very soon becomes something else than copperas; it does not stay in the soil any length of time.

QUESTION: Will you tell us how to apply the Chile saltpeter?

MR. HILGARD: In regard to the matter of applying it, Chile saltpeter is an exceedingly soluble substance; it takes very little water to dissolve it; in fact, if you expose it to the moist air it becomes liquid of its own accord. The best method is to sprinkle it over the soil generally—not just to put it around the tree, but scatter it around and over the soil of the orchard, if the orchard is old; if the orchard is young, it is best to put it around. The quantity I have stated would be for a full-grown orchard.

NEXT PLACE OF MEETING.

MR. KELLS: I beg to offer the following resolution:

Resolved, That we request the State Board of Horticulture to discontinue the spring Convention, and that the next Convention be held at Marysville.

Adopted.

MEMORIALS TO THE LEGISLATURE.

W. H. AIKEN offered the following memorials to the Legislature of California:

To his Excellency the Governor of California, and the honorable the Senate and Assembly of the State of California, in Legislature assembled:

Your memorialists, the fruit growers of California, in Convention assembled, this twenty-first day of November, 1890, at Santa Cruz, most respectfully represent:

That the climate and soil of this State are adapted to the growth and preparation of fruits of good quality and in quantities sufficient, eventually, to supply the demand for such products in the United States, especially prunes, raisins, figs, olives, and olive oil. The success of this enterprise is of the greatest importance to the State and nation.

That the spread of scale insects from foreign countries in California threatens the continued successful cultivation of fruit trees subject to their ravages. Parasites have been found in foreign countries—especially Australia—that live upon and destroy the scale. Your memorialists, therefore, respectfully and earnestly request an appropriation that will enable the State Board of Horticulture to import to this country parasites for scale insects.

That the Secretary of this Convention shall transmit this memorial to the Legislature as soon as convened.

Adopted.

To his Excellency the Governor of California, and the honorable the Senate and Assembly of the State of California, in Legislature assembled:

Your memorialists, the fruit growers of California, in Convention assembled at Santa Cruz, this twenty-first day of November, 1890, most respectfully represent:

That the State Board of Horticulture has rendered very important and valuable services to the State of California, and this Convention respectfully request that the same appropriation be made for the uses of the State Board of Horticulture for the two years from July 1, 1891, that was made for the past two years.

Adopted.

To his Excellency the Governor of the State of California, and the honorable the Senate and Assembly of the State of California, in Legislature assembled:

Your memorialists, the fruit growers of the State of California, in Convention assembled at the city of Santa Cruz, this twenty-first day of November, 1890, respectfully represent:

That they are engaged in fruit growing, an industry of great importance to the State. That more stringent laws should be enacted to protect and promote horticulture.

The Legislature is urgently requested to protect and promote the horticultural interests of the State by such legislation as shall be deemed advisable and effective.

Adopted.

REPORTS OF COMMITTEES.

MR. PRESIDENT: Your committee to whom was assigned the duty of examining and reporting upon the display of fruits and flowers made in connection with this Convention, and to make suitable acknowledgment for the hospitality and favors extended to us as guests of the city, beg leave to report as follows:

The exhibition, while necessarily small from lack of room, calls forth our especial commendation for the artistic manner of the display, and for the variety and excellence of the fruits and flowers produced at this season of the year. While it would be inexpedient to mention each of the very creditable collections, we deem it proper to make favorable mention of the following:

D. C. Fesley, Santa Cruz.—Mountain grapes; varieties: Muscat, Black Morocco, Black Malvoisie, Verdal, Cornichon, Mission, White Nice, Flame Tokay, Muscatelle, Gordo Blanco, Emperor, and Black Ferrara.

A. P. Hendon, Santa Cruz.—Seven varieties of apples, unnamed.

Dakin & Loomis, Laurel Glen Fruit Farm.—A large display of apples and grapes, clean and healthy. Not being a committee on nomenclature, we regret the partial absence of labels from this excellent collection.

M. Denicke, Fresno.—Display of sun-dried White Adriatic figs in layers; fully equal, if not superior, to the best from Smyrna.

A. B. Van Arsdale, Yuba City.—Sun-dried White Adriatic figs, from two-year old trees.

G. W. Carpenter, Sutter County.—Raisins, loose and in layers; of excellent quality.

J. A. McMillan, Church Point.—Brown Turkish figs.

Noah G. Rogers, Los Gatos.—California prunes and Moorpark apricot, sun-dried. These are unsurpassed in quality and appearance by any we have seen.

The Mosher-Craig Company, San José.—The largest, most varied, and best exhibit of

mechanically dried fruit. In this collection are pears dried two years ago, and still in an excellent state of preservation.

Felix Gillett, Nevada City.—D'Ente and Mont Barbat prunes, and Marron Combale chestnut. The prunes are an excellent imitation of the French method of preparing dessert prunes.

Thomas Slaughter, Santa Cruz.—Sun-dried and evaporated prunes, apples, and plums. We call special attention to the whiteness and flavor of the apples, on which no sulphur was used.

J. P. Onstott, Yuba City.—Display of Thompson's Seedless grapes and raisins. We find them larger and superior to the Sultana.

J. S. Young, Hazel Glen Ranch, Santa Cruz County.—A most excellent display of apples; varieties: Wine Sap, Rhode Island Greenings, Red Pearmain, Jonathan, Newtown Pippin, Spitzenberg, Lady, Yellow Bellflower, Baldwin, and Smith's Cider.

W. W. Watermain, Fair View Farm, Laurel, Santa Cruz County.—A fine display of Verdal, Flame Tokay, Mission (one cluster weighing five pounds), and Muscat of Alexandria grapes.

H. B. Pilkington, Loma Alta Farm.—A very creditable display of apples; varieties: Spitzenberg, Newtown Pippin, White Winter Pearmain, Fall Pippin, Bellflower, Red Pearmain, and Smith's Cider. In this collection we notice a basket of miscellaneous fruit, containing very fair oranges.

Mrs. L. U. McCann, Santa Cruz.—A very unique and tasteful display of small fruits. Here the raspberry, the blackberry, and the strawberry (than which God might have made better fruit, but never did) are seen growing and ripening on the canes and vines. The question has been asked, "What can woman do?" We answer, "She can raise the best of fruits and make the best of speeches; what more would you have her do?"

A. Noble, Rosedale.—Display of White Winter Pearmain, Virginia Greenings, Red Pearmain, Yellow Bellflower, Wine Sap, Newtown Pippin apples, and a wonderful and brilliant display of chrysanthemums of new and choice varieties.

T. Thompson, Santa Cruz.—A most pleasing and attractive collection of camellias, ferns, palms, tuberose, chrysanthemums, and other rare plants and flowers. The camellias deserve particular mention, as the observed of all observers.

Time and space fail us or we would mention more fully the Easter Beurré pears of C. C. Miller, of Santa Cruz; the cluster of Japanese persimmons (seventeen on a twig), from a tree fifteen years old raised from seed, by Samuel Kellett, of Calistoga, Napa County; the seedless raisins, peaches, and apples of L. Wietz, of Farmington, San Joaquin County; the apples, pears, and persimmons of Mrs. D. W. Thompson, of the Big Pear Tree Farm; the Chance Seedling apples of C. C. Miller, of Santa Cruz County, grown without cultivation, irrigation, or pruning; the Yellow Newtown Pippins of L. Mason, and the Baltimore Reds of Lawrence Ollason, of Pajaro; the pampas plumes of O. H. Bliss, of Santa Cruz; Curious Medlers of C. Steinmetz; the excellent Eureka lemons of N. W. Blanchard, of Santa Paula; apples and pears of Doyle & Harmon, of Santa Cruz; Dr. O. L. Gordon's bunch of green oranges; the Manzanillo, Nevadillo Blanco, Redding Picholine, and Mission olives rooted from top cuttings by Geo. H. Kunz, of Sacramento; the beautiful orchid water lily (*Pontederia*) of Mrs. W. H. Miller; the exquisite hydrangea of Mrs. Hattie Curtis, of this city, and the chrysanthemum pillow of Mrs. Keville, of this city.

A device for conveying fruit from the tree to the ground, invented by J. A. Chapman, of Lakeland, Florida, and presented by N. H. Claffin, of Riverside, is worthy of special mention, as are also the paraffine paper and the Bean spray pump; but we must stop somewhere.

For the Santa Cruz "Daily Sentinel," "The Daily Surf," for their excellent reports of this Convention; for the Southern Pacific Railroad Company, for reduced rates; for the hotels of Santa Cruz, for reduced rates and excellent accommodations; for the Young Men's Christian Association, for the use of this cozy and comfortable Assembly Room; for Mayor Bowman and Judge Aiken, who have contributed so much to the success of this Convention, and for all the good people of Santa Cruz, and especially the ladies, for the freedom of their city, their good will, constant, kind attention, and generous hospitality, we bespeak the heartfelt thanks of this Convention, and extend our best wishes for their future happiness and prosperity.

To our honorable President and Secretary, for their indefatigable zeal and labors in our behalf, we return most grateful thanks, and wish them both long life and ever increasing happiness in the pursuit of horticulture.

H. C. DILLON, Los Angeles County,
GEORGE J. MITCHELL, Los Angeles County,
HIRAM HAMILTON, Orange County,
R. C. KELLS, Sutter County,
FRED. C. MILES, Placer County,

Committee.

Adopted.

REGISTRATION OF PLANTS.

MR. PRESIDENT: Your Committee on National Registration beg leave to report, and recommend the adoption of the following:

Resolved, That we, the fruit growers of this State, in Convention assembled, do heartily

indorse the action of "The Joint Committee upon the National Registration of Plants," and their efforts in behalf of the horticulturists and florists of this State. We urge them to prepare, at an early day, and present to Congress, a bill to establish, under the Department of Agriculture, a division having in charge the nomenclature and registration of all commercial plants and plant life.

All of which is respectfully submitted.

ALFRED T. PERKINS,
R. C. KELLS,
B. M. LELONG,
Committee.

Adopted.

COOKE MONUMENT.

MR. PRESIDENT: The committee appointed by this Convention at Chico, in 1888, and granted further time at the Convention held at Fresno in 1889, in the matter of a monument to the late Matthew Cooke, wish to report as follows:

Would recommend that a monument be erected by the fruit growers of California to the memory of the late Matthew Cooke. That the expenses of the monument be provided for by subscriptions by the growers as a body. That a committee be formed to receive subscriptions from the fruit growers for that purpose, and that the committee have the general supervision of the funds and the building of a monument.

Respectfully submitted.

WILLIAM JOHNSTON,
Chairman.

NEW COMMITTEE.

The President appointed Wm. Johnston, of Courtland, E. Booth, of Roseville, and Samuel McKinley, of Los Angeles, as the committee to receive subscriptions towards a monument to the late Matthew Cooke.

VOTE OF THANKS.

MR. BERWICK: I hold in my hand a book—the report of the State Board of Horticulture. This book, I think, would be a credit to any State Board of Horticulture. I feel proud to see a book of that kind in California, and I want to add a vote of thanks to the State Board and to Mr. Lelong for publishing so valuable a report for the benefit of the fruit growers of this State; and I move you, sir, that the thanks of this Convention be tendered to the State Board of Horticulture and to Mr. Lelong for the work that they have given us.

Adopted.

The Convention then adjourned *sine die*.

B. M. LELONG,
Secretary.

TRANSACTIONS

OF THE

FIFTEENTH STATE FRUIT GROWERS' CONVENTION,

HELD AT

MARYSVILLE, NOVEMBER, 1891.

TRANSACTIONS
OF THE
FIFTEENTH STATE FRUIT GROWERS' CONVENTION,
HELD UNDER THE AUSPICES OF THE
STATE BOARD OF HORTICULTURE, AT MARYSVILLE,
NOVEMBER 17 TO 20, 1891.

CALLED TO ORDER.

The Convention was called to order promptly at 10 o'clock by Vice-President L. W. Buck, in the absence of President Ellwood Cooper.

PRAYER.

Rev. L. J. Garver opened the Convention with prayer.

VICE-PRESIDENTS.

B. F. Walton, of Sutter County, and J. B. Fuller, of Yuba County, were chosen Vice-Presidents.

ADDRESS OF WELCOME.

By JAMES O'BRIEN, of Smartsville.

MR. PRESIDENT, LADIES AND GENTLEMEN: The representatives of the horticulturists of Yuba and Sutter Counties, and the citizens of those counties, join in tendering you a hearty welcome to our section of the State.

To no assemblage of a representative industry of California can the people of this section extend a heartier welcome than to you, representing as you do the fast becoming leading industry of this State.

A few years ago, you are all aware, this section of our State was devoted entirely to the mining interests. As the products of our mines decreased attention was called to the production of cereals. In this we excelled. As the country became more populated the value of land increased, necessitating the production of commodities other than wheat and barley. Then was our attention called to that great art, horticulture.

Within the last few years, where were large grain fields, are now to be found orchards and vineyards, the nucleus of many happy homes.

In our valleys and in the foothills adjacent you will, before your visit draws to a close, have an opportunity to observe the progress that has been made within the past few years. Our deciduous fruit compares

favorably with any produced in the State, and has the additional advantage, owing to climatic influences, of being marketed as early, if not earlier, than in other less favored localities. Our citrus fruit industry is as yet in its infancy, but its success is assured, as has been fully proved at Colmena, Palermo, and Smartsville, the oranges grown at the latter place having been pronounced by the judges at our last citrus fair as the finest they had ever seen. During your short stay with us we know we will be benefited by the advice you will give and the experience you possess, and you will find us willing students of our art. We are anxious to learn all that we can from you. Time and experience have shown to the world that great good results from the interchange of opinions on any subject-matter that may be brought forward for general discussion, and in no branch of the world's work has general discussion been of so prolific benefit as in the art of horticulture.

Looking backward to the early work of horticulture in this State, we find that in no State in the Union has progress been so marked and satisfactory as in our State, and all owing to what? To the gathering together of the representatives of our art, and the thorough digestion of each principle and part of the many divisions of our work which are brought forward at these reunions.

You have at this particular time granted us the favor of one of these reunions, and rest assured we shall take advantage of it, both in deriving the benefit of your experience, and in noting the criticisms you will make of the methods employed by us in horticulture in Northern California.

During your stay we will ask you to view a few of the historical orchards of our section. Many of you being pioneers of the days of gold, will recollect our first horticulturist, John A. Sutter, whose old home, Hock Farm, lies on the bank of Feather River, in Sutter County, about five miles west of here. Also the orchard of that pioneer who spent his life and his fortune in the interest of horticulture, the grower of the first early fruit—John G. Briggs; and should your time allow you, visit our foothill section, where in years past the rocker and monitor held sway, but now are to be seen groves of deciduous and citrus fruits.

Your humble servant is, as you are probably by this time aware, not an orator nor a word painter, hence his inability to fully express to you the welcome with which we greet you. But in conclusion will say from our hearts, our homes are yours. You are welcome, and we know that as our acquaintance broadens, as the contact with one another increases, not only will we be benefited by the relation, in matters pertaining to our craft, but mentally, morally, and socially. Friends of horticulture, you are doubly welcome to Yuba and Sutter, the sister counties. [Applause.]

ADDRESS OF VICE-PRESIDENT L. W. BUCK.

FELLOW CITIZENS: We assemble here to-day under the auspices of the State Board of Horticulture. In the absence of our worthy President, Ellwood Cooper, who, on the eve of starting, was taken suddenly ill, the pleasant duty of presiding over this intelligent assemblage devolves upon me, by virtue of my position of Vice-President. I deeply regret his inability to be with us to-day, as I know how much he would have

enjoyed being present, and renew that friendship so happily begun at all previous sessions. We shall miss in him a veteran horticulturist and an able presiding officer.

I am not able to go into details of many things that our worthy President would be able to do were he here. Nor have we been able to have the annual report for this year, in which the proceedings of the last meeting should appear, ready to hand to you, as was done at our last meeting at Santa Cruz; not from any want of diligence on the part of our able Secretary, but through circumstances over which we have had no control. It is now in course of completion, and will soon be published. In it will be embodied the proceedings of our last Convention and those of this one now convened. During the year numerous bulletins have been issued of many investigations, and are here for distribution, and we hope every one will avail himself of a copy.

The State Board has provided for these yearly meetings in different sections throughout the State, to enable you and us, that are engaged in horticultural pursuits, to come together for a general interchange of ideas, and be profited by comparing views on the many questions regarding which we have a common interest.

This will be the fifteenth State Fruit Growers' Convention, and the eleventh held under the auspices of the State Board. I desire to call your attention to a matter that is of vital importance to the fruit industry of this State—both citrus and deciduous—and that is the wholesale importation of Eastern and foreign trees infested with insect pests and fungous diseases. There can be no doubt that a law should be enacted by the Legislature that would forever stop their wholesale distribution. The law does not now prevent any one from importing trees and plants, but does provide the necessary requirements after the trees are landed, when, if found infected, they may be disinfected, or action brought before the Courts to declare them a public nuisance, and the Court may or may not order them destroyed. The Constitution forbids the Legislature from giving judiciary power except to Courts, but a law could be enacted that would prohibit the entry of trees from States and countries where deadly diseases abound. A provision should also be made whereby the importers could be made to suffer the costs of action. A case tried in Los Angeles was a great expense, borne by that county and the State.

The wholesale adulteration of foods, and especially olive oil, is really appalling. An organization composed of foreigners has in contemplation the establishing of a depot at San Francisco, for the purpose of disposing of oil purporting to be pure and made of olives. It was to enlighten the people as to the unwholesome effect of these spurious articles that a Convention was called by this Board, for the purpose of having the growers unite to defeat, in a measure, the sale of such goods under false representation. The result has been that since their organization the people have been taught, in a measure at least, the injurious effect of adulterated oils upon the human system. Of the many samples of so-called olive oils that were given to the State Analyst to test as to purity, only a small percentage were found free from ingredients known to be injurious. This investigation will be continued, and, with the aid of the government chemist, it is expected that much good can be done, until the passage of such legislative enactments as will secure the results desired.

Complaints were also received showing that some fruit canneries have

canned California fruits without sugar, using only water. These goods, we understand, have been put up for dealers outside of the State, greatly to the injury of our fruit trade. Also, that Eastern fruit is being labeled and sold as a California production. Such practices should be condemned and steps taken to punish the offenders.

It is of the utmost importance to the producers of our country to know, from time to time, the condition and amount of the foreign products with which they compete. To this end we have asked the Department of State, at Washington, to instruct the consular officers throughout the country to report by telegraph the condition and amount of all crops with which those of this country compete. The department asked that the subject-matter be referred to the Secretary of Agriculture, and if he considered the matter of sufficient importance, for him to advise the State Department and offer such recommendations as he would deem proper to make. The Associated Press dispatches from Washington have announced that such recommendation was but recently made.

Insect pests are better understood than formerly, and effectual remedies have been invented; yet there is always room for improvement, and the discussions ought to give us more enlightenment. The future of successful fruit growing in this State depends upon keeping out the baneful maladies that have proved a great menace to the industry in many parts of the world. You are asked to adopt measures whereby this may be accomplished. The Legislature wisely provided an appropriation of \$5,000, which enabled us to send Albert Koebele, the expert who discovered the *Vedalia cardinalis*, to Australia, New Zealand, and adjacent countries, to search for and import the parasitic and predaceous insects that may be found there, with the hope that some, at least, will prove equally beneficial. The Department of Agriculture promptly responded to our request, and lost no time in allowing Mr. Koebele to be sent on this important mission; therefore, we should not be unmindful, and express to "Uncle Jerry" an expression of our regard.

Nothing connected with the coming Columbian World's Fair presents itself of more importance to the producers of this State than the adoption of a scale for judging fruits. In the East various scales of such character are in use, but none of them are such as producers in this State could compete with. The reason for this is that the fruit of the East is grown under very different conditions and in different soil and climate. Scales for judging such fruits cannot apply to our fruits, as grown on this coast under entirely different conditions. Our fruits beat the world in all respects, but it cannot be expected that fine fruit could ever compete against fruit to be judged by a scale made applicable only to it. I recommend the appointment of a committee to formulate such scale, for judgment of all fruits, for your adoption.

I well remember, only a few years ago, when through the persistent efforts of the late Matthew Cooke, who may well be called the pioneer in bringing out remedies for the many fruit pests that we have been troubled with, the first law was passed by the Legislature to quarantine infected trees and fruit packages, and the strong opposition of fruit growers themselves to the enforcement of said law. But now the fruit growers of the whole State are anxious to know how to act, and through the experimental work of the State Board of Horticulture have been able to, in a large measure, save their deciduous fruits from the ravages of the Pernicious scale.

There was a committee appointed some time ago to take measures to raise money to erect a monument to the memory of Matthew Cooke, and I hope before this meeting closes that said committee will be able to report that they have succeeded fully, and that before many months elapse a monument will be erected which will show that the fruit growers of California are not ungrateful for the valuable services rendered by that friend of the fruit growers, Matthew Cooke, whose time and money were always at their command.

There are many subjects of importance that may well be brought up before this Convention of fruit growers and those interested in fruit growing, such as the best methods of growing, picking, packing, shipping, and marketing fruits, transportation, needed legislation, the Columbian World's Fair Exhibition, the issuing of an abridged report from 1885 down to 1891, and any matters that you may deem proper to take action upon.

POEM.

MISS ALICE PRATT, of Santa Rosa, read a most appropriate poem entitled "California," which elicited much applause.

OUR CHIEF EXECUTIVE.

At this stage of the exercises Governor Markham appeared, supported upon the arm of John H. Jewett, who introduced the Governor in the following language: "Mr. President, I have the honor of introducing to you the Governor of California."

THE PRESIDENT: I am happy to meet you; and on behalf of this Convention I heartily welcome you here. It affords me great pleasure, ladies and gentlemen, to introduce a gentleman in whom we all have a very deep interest, our Governor.

ADDRESS OF GOVERNOR H. H. MARKHAM.

LADIES AND GENTLEMEN: When I received the notice yesterday that I would be expected to reach here to-day, I hardly knew whether it would be possible for me to respond. In fact, I have every day in the week allotted to something that I have promised to do, but when I found it was possible for me to come and be able to return to attend to those matters, I concluded to be present. But I found myself, Mr. President, in a very awkward situation when I seated myself in the car this morning. I realized I was coming here to meet the most intelligent body of citizens in the State of California, and reflecting that I did not know what I was coming for, or what I would be expected to say when I reached here, I had a notion to return and find out. I finally concluded not to do that, because I apprehended on arriving here I might learn something in regard to the objects of this meeting.

I realize that you have come here to discuss one of the greatest industries of this State, and I hardly know what I can say to you that can be of interest, because I apprehend that there is not a man here

who does not understand the work that he is engaged in better than it would be possible for me to tell him. I can say, however, that when I left the East to come to California, I had always, up to that time, practiced law. I knew nothing of fruit growing; I hardly knew the different kinds of fruit, except as I purchased it in the market. I came to California with the idea that I wanted to be a fruit grower, so I bought a fruit ranch, and started out in earnest to raise it.

I believe it will not be out of place for me to give you a little of my experience, because before this Convention is over you will hear a great deal upon the question of theories, and some of the best theorists in fruit growing never raised a particle of fruit in their lives, and have never picked a pound of peaches in the world. I began with a young orchard of trees not as tall as myself [laughter], and when the first crop ripened—and I assure you I thought it never would ripen—I started out one morning about four o'clock to pick the peaches I thought were ripe to take to the cannery, and have them canned. I did not understand picking them very well, or how to test them, or know just what to do, but I felt of every peach to determine if it were in proper condition to pick. I worked very industriously until eight o'clock, and then had my breakfast, after which I started for the cannery. On my arrival they were weighed out, and I received for them just 37 cents. [Laughter.] Now, the peaches were not to blame, and the trees were not to blame, but I simply picked them a little too early, and it took me a great while to find a very few peaches that would do for canning purposes. After that I concluded to wait until the peaches were in better condition. I have followed that up, and I have never lost interest in it. I have worked personally in the cultivation of fruit, and if I wish to have anything done that is really scientific, my hired man renders me all the necessary assistance, because he knows more about it than I do. [Laughter.] In a short space of time I learned to pick peaches as well as he could, and received as good a price in the market as he did. The fact of attending to these things personally, and entering into the absolute labor necessary to produce fruit, has given me a great interest in the business, and I have gotten so now that I can talk of fruit first rate. Of course, I do not want the most experienced men who are in the business to talk to, because I do not think I would create a favorable impression; but the ordinary fruit man I can converse with in a very intelligent way, and he goes off feeling and believing that I know a great deal about fruit raising. [Laughter.]

The impressions that I received concerning the fruit ranches in this State can be related in a very few words. I have felt that if we could have our fruit ranches taken by industrious people, by people who, with their families, are willing to work and devote the same time and attention to them that the farmer and his family do in the States, there could be little question that money could be made more easily in California than it is made on the ordinary farm in the East.

I believe there is not a person here who will not bear me out in the assertion that there are very few farms in the East of one hundred and sixty acres, after the interest and necessary expenditures for keeping the farm in proper condition were paid, but would leave very little at the end of the year for the owner's work; but in the East, as we all know, the average wealth of the farmer who went into Wisconsin, Minnesota, and Iowa, for the first ten years, was about \$150. They went in there

and worked; every man worked from sunrise to sundown; every child in the family had something to do, and in that way, by the strictest economy, in a very short time they were able to have all the comforts of life; and to-day, in many of those States, they are very comfortable, and most of them independent.

In the neighborhood where I settled I found it filled up with men like myself, who had always been accustomed to doing something else; always merchandising or engaged in some profession, and who were not accustomed to doing labor that could be employed at \$1 or \$2 a day, and the consequence was that they hired everything done. If they had fruit enough to pay them for going to market they would go, and if they thought there was not quite enough they would simply stay at home, and let the fruit rot on the ground. Now, that is the history of those among whom I settled for the first few years. If it were possible for them to do East upon the farm as I have recited, everybody do something toward taking care of the fruit, it would, at the end of the year, be a benefit to the family who availed themselves of the opportunity.

I am pleased to note that wherever I have been throughout the State for the last two or three years, I find that the canning and drying of fruit, and in many instances picking, is being done by the ladies, and oftentimes by children; and they do it without a feeling that they are doing anything wrong, and without injuring their health in the least. They do that kind of work which requires a little skill and time, but not so very much hard labor.

I was proud of my two little girls when I returned from Washington two or three years ago, when my wife recited to me what they did. They applied to their mother for an opportunity to earn something for themselves, and she said: "If you want to earn something there are some peaches there; dry them, and whatever you gain for them you shall have for yourselves." I want to say to you that those two little girls, without the slightest assistance from anybody, prepared the peaches, apricots, and prunes, dried and put them into sacks, and I took them to town myself, sold them, and received \$96 for their labor that fall. [Applause.]

It occurred to me at once that even the children, if they saw fit, could help to earn something towards supporting the family and caring for themselves. I think every boy and girl should be taught to know what it is to earn a dollar by their own hands, let them be rich or poor. [Applause.] It is the unit upon which we have to base everything. Every time a man spends \$5 that is useless he ought to realize, if he works by the day, how long it will take him to earn it. Of course, I am talking to gentlemen here who are along in years. You have earned what you have, and all you have to do, if it is possible, is to teach your children, let them be boys or girls, what it is to know the value of money, and not allow them to grow up with the idea that their parents will leave their wealth for them to squander. There was a time when we considered it a very unfortunate thing to be born poor. At the present time, I regret to say that you can scarcely find one boy who has been born rich who continues to be a good man all his life, and if he does he is entitled to a great deal of credit, because he cannot appreciate money like the boy who earns it himself.

It is needless to say that fruit raising is one of the greatest industries of this State. You all know that, but it has impressed me deeply that a

large proportion of the fruits we produce cannot be produced anywhere else to that degree of perfection to which we are capable of producing it here; and that being the case the whole world will look to California for fruit. Of course, we have one serious problem to solve, and that is the marketing of our fruit; not to the wholesale dealers, not to the middle men particularly, but to the people themselves. Our fruit at public sale brings no more than it ought, but when it passes from the wholesale dealer, or the auction man to the retail man, then the first thing he does is to put up his sign that he has California fruit for sale, and charges three prices for it. That I have found to be my experience in the various cities I have visited. Just what we can do to overcome that I do not know, but I do know this, Mr. President, that when our fruit can be produced as cheaply, according to the quality, as our Eastern fruit, we shall never have any difficulty in disposing of it.

I can only say this much, that the course which this Board has taken, so far as I am aware, for the last few years, is in entire accord with my ideas of disseminating knowledge throughout the whole State. It is worth a great deal to any one who desires to go into fruit raising to hear from some practical fruit man or woman, the real course to be taken from the time the ground is prepared to receive the trees until the fruit is dried, shipped, and marketed; and certainly it is worth more to the uneducated fruit man to hear the intelligent discussions emanating from this Convention, than to gaze on the finest display of fruits in the world. You can look at fruit; it is attractive to the eye; it is beautiful; it is a good thing to have; but you would prefer to talk to some one who is thoroughly posted, and who will tell you what he thinks you ought to do and what he did, and what he thinks you can do, in order to accomplish the same results. This knowledge is something you can take with you, and will be of priceless value. This coming together to compare notes, discussing the methods, plans, and the varieties of fruit, what will be the best, what will sell the best in the market, are certainly important problems for the fruit grower to understand.

In my old State, the State of Wisconsin, they had a great many fairs, and exhibited everything usually connected with them. The people went to see the beautiful flowers, looked at the different kinds of stock, but they made no progress until a farmer by the name of Hiram Smith, who was a very practical man, conceived the idea that it would do the farmers of Wisconsin more good to come together and discuss what the profit might be from the things they saw at the fair than the actual exhibition of the things themselves; therefore, he organized an association of farmers, and since then the fairs have diminished into insignificance. This knowledge, I say, has been disseminated by the farmers getting together and comparing notes. Hiram Smith did not know it all; he only conceived the idea that if they could come together and talk matters over, he would learn something, and be able to teach others.

When we take into consideration the labor performed and the immense amount of literature sent out by this Board, it is no wonder we have made great progress. If I could spare the time I would give more to stay right here for the next two or three days, to listen to the discussions upon the papers that will be read, than almost anything I can think of, and I know I would learn something, whether any one else did or not.

I think that it is very important that every business man should endeavor to learn what you are doing for the interests of this great State.

I will conclude, ladies and gentlemen, by saying that I am very glad to have met you, and thank you for your very kind and earnest attention. [Applause.]

PRESIDENT BUCK: I will say, Governor, that on behalf of this Convention I tender you our thanks for the able remarks you have made, and I can only say that I wish you could be with us through the Convention. It is now half-past eleven, and I will declare a recess, in order to afford the members an opportunity of grasping our Governor by the hand.

Recess.

AFTERNOON SESSION.

W. H. ROBINSON, of Stockton: I move that the reference in the address of the President be referred to a special committee of three, to report to this Convention on the matters recommended therein for its action.

Adopted.

The Chair appointed R. B. Blowers, of Woodland, W. H. Aiken, of Wrights, and Frank A. Kimball, of National City.

FRUIT VS. GOLD.

By JOHN GOSS, of Santa Rosa.

The growth of California may be divided into three periods: First, the golden age, or age of gold; second, the cereal age, or age of wheat; and third, the horticultural age, or age of fruit and seeds.

Each period existed to some extent from the beginning till now, but we can safely assume that the golden age reached its highest point from 1850 to 1860; the age of wheat from 1860 to 1880, and the horticultural age from 1880 to the present time.

It is the purpose of the present paper to note some of the characteristics which attend the introduction of fruit culture, as distinguished from the prominent features of the gold or mining period.

First, as to value. It is difficult to obtain exact statistics of gold production, but from all the data that can be collected, it may be assumed that the annual production of gold in California has been about \$15,000,000 or \$18,000,000 per annum; the very latest reports place it at nearly \$14,000,000, and about \$1,000,000 in silver. Turning to the value of the fruit production for the past year, by culling a few items from the daily press, we find data on the fruit question as follows:

SAN JOSÉ SENDS OUT THE HEAVIEST SHIPMENTS IN ITS HISTORY.

SAN JOSÉ, October 12.—The shipments to the East from here last week were the heaviest in the history of the railroad. The total fruit and other products sent away amounted to 4,010,420 pounds. Of this 1,576,845 pounds were canned goods, 1,040,245 green fruit, and 1,177,105 dried fruit. The shipments of garden seeds were 36,280 pounds.

This, it will be seen, was but for one week.

The story of a giant industry less than ten years of age is briefly told in the following dispatch:

SECOND-CROP RAISINS—FRESNO COUNTY MAKES ANOTHER BIG SHIPMENT.

FRESNO, October 14.—A special train of twenty-six cars, all loaded with raisins, left this evening for New York, via New Orleans. This makes two hundred and fifty carloads of raisins that have been shipped East so far this season, or an equivalent of twelve solid trains. The weather for the past two weeks has been the very best possible for curing raisin grapes, thus making the second crop large and of better quality than that of last season.

Here is another:

RIVERSIDE, September 4.—The "Phoenix" will publish to-morrow an estimate of the raisin crop of San Bernardino County for this season, showing a total for the county of 400,000 boxes of twenty pounds each. The different localities are accredited as follows: Riverside, 150,000 boxes; Etiwanda, 100,000; Cucamonga, 50,000; Redlands, 50,000; Ontario, 25,000; Highlands, 25,000. The crop is the finest ever raised in this county.

And how is this?

NEW YORK, September 21.—The "Commercial Bulletin" says: The exports of raisins from Denia thus far have been only 50,000 boxes for America, whereas for the corresponding period last year 468,000 boxes were in transit. It is evident that the competition of California is feared, and importers hesitate to send forward any considerable orders upon the basis of the values cabled. Several carloads of three-crown California raisins in sacks sold here last week at 6 cents, delivered here.

These are only a few haphazard excerpts from the daily press, from the leading points of production. What the sum total of the value of our horticultural products would be in one year, it would take a very lengthy investigation to tell, but there is no doubt it would cast the yield of gold and silver combined into impenetrable gloom.

Before leaving the subject we might append a few more significant facts, thus:

WASHINGTON, September 24.—The fruit exhibit in connection with the meeting of the American Pomological Society, though never a leading feature of these meetings, is a very creditable display, showing on the whole careful and intelligent selection. The champion Navel oranges come from California, five to six inches in diameter; and that State also takes the palm for magnificent quinces.

A railroad official puts the matter thus:

It is generally an easy matter to gauge the prosperity of a State when its balance of trade is on the right side, or is even. In former years, the shipments from the East to California by rail were much larger than those from this State east-bound. We used to haul many empty cars to the East in order to secure west-bound tonnage. The volume of the east and west-bound shipments is about even, and the cars that come in loaded go back loaded. This is the direct result of the change of the character of the products of California. Cereals have been supplanted by the more valuable product of deciduous and citrus fruits and other crops, the movement of which has equalized that of the manufactured goods coming here by rail from the East.

Speaking of the great and justly esteemed friend (?) of the farmer, the railroad corporation of this State, it is well to note that the gold and silver output of the State, or of the entire coast, was not sufficient to support one transcontinental railroad, while since the successful development of horticulture we now have seven distinct lines, only one of which, however, centers in California, much to her misfortune.

It is estimated by a San Francisco paper that it will take five thousand cars to transport the orange crop alone, and this number, by the way, would make a train between fifteen and twenty miles long.

Leaving now the mere money value of our horticultural products, we will turn to some of the other effects.

First, as to the home-making process. Only a few years ago land was held in such large quantities by single individuals that it would

make a baron of the Middle Ages blush for shame, and this was in what we were wont to call "a poor man's country." Had the process not changed, it would have been the poorest country on earth for a poor man to come to. But the change has come. The owner of twenty, ten, nay, five acres is no longer despised, and it could be easily demonstrated that there are numbers of those who till five, ten, or twenty acres of land who live more comfortably on their small holdings than the slip-shod farmer formerly did on his proverbial quarter section. The tendency, nay, the actual fact is, that large land owners have been compelled to subdivide their lands, and thus destroy what at one time was the greatest curse of the State.

There was but slight difference between the Spanish caballero, who fed his flocks on a hundred hills, running rough-shod over his less wealthy neighbor, till gambling and whisky clapped a mortgage on his ranch, and the American pioneer who did the same thing.

In educational matters the result has been keenly felt. The increase in public schools from 1870 to 1880 was 1,500, from 1880 to 1890 was 1,764. The increase in teachers from 1870 to 1880 was 1,700, from 1880 to 1890 was 2,539. This is easily explained. The large farm usually supported one family, the children of which attended schools in large cities, and the little red school house was left to afford a safe hiding place for the yellow-hammer and the wood-pecker. But now there are ten families where formerly there was one, and twenty children where there formerly were but two or three, and the effect is seen in the school first of all.

In the next place, let us look at the effect of horticulture on town-building. Since the culture of fruit commenced, towns have sprung up like magic. These are not like the mushroom growths of the mines, but solid, permanent, and substantial. Such cities as San Diego, Los Angeles, Fresno, Chico, Pasadena, Riverside, and scores of others owe the rapidity and permanency of their development to horticulture.

With the towns has come the high school, the Sunday-school, and increased and ever increasing social and political advantages, and around these cities are growing up numerous and valuable suburban additions.

There is another respect, too, in which a wide change and difference are seen, and that is in nomenclature; that is, the naming of places, towns, and localities. In the "good old days" such names as Hangtown, Dogtown, You Bet, Shirt-tail Cañon, Roaring Camp, Poker Flat, and many others, were familiar, but they live now only in the imagination of the local satirist; but to-day we have Pomona, Riverside, Redlands, Ceres, Oceanside, Pasadena, Palo Alto, and others as euphonious and suggestive.

May we not safely assume, therefore, that the period of horticulture outranks the gold-hunting era in pecuniary importance, in home-making influence, in school-building power, in town-creating force, in social, moral, and political importance.

I have said nothing of the much larger army of employés that receive work, directly and indirectly, in the cultivation, picking, pruning, packing, drying, and handling of fruit, than that employed in mining. Tens of thousands of laborers receive employment in summer, who otherwise would be idle, and when we remember that women and chil-

dren are largely benefited by the former system, the value of the new direction to our industries becomes of paramount importance.

It might be added, to conclude, that we are at the beginning of fruit culture, and the end is not in sight. If the work goes on there is no telling what a state we may reach. Possible fifty years from now the man who owns ten acres of bearing fruit will be considered wealthy, and he who has a half acre will be well off.

THE CARE, GRADING, AND SELECTION OF FRUIT.

PRESIDENT BUCK: As there is no essay upon the subject, we will be glad to hear from any one who has anything to offer. I hope you will not waste time. I will call on Mr. Block, of Santa Clara, as he is a very good talker.

A. BLOCK: I am not prepared to deliver an essay upon a moment's notice, but will be glad to answer any questions that may be asked in relation to subjects I am familiar with. I think, though, these discussions ought to follow essays.

MR. BUCK: I think a more practical result will be obtained by oral discussions than by written essays. You forget what is in an essay, but when my friend Block gets up and talks you can understand what he says, and he talks right to the point.

R. B. BLOWERS: What is the best sized pear for shipping to the Eastern States from a market standpoint?

MR. BLOCK: I am sorry to say that I am not ready to answer that so as to make it satisfactory. Now, some varieties of fruit of the larger size are more desirable.

MR. BLOWERS: Well, confine your answer to the larger size.

MR. BLOCK: I have no doubt that the Bartletts would be the most desirable, although I am satisfied that the smaller sizes for shipment are the most profitable. Our Sacramento friends are picking Bartletts very little over half grown, and ship them in order to get them in early, and in that way they realize much better prices than we in our locality for the full grown and much better fruit. In fact, some dealers in the East would prefer to have the smaller size of the same variety, while others prefer the larger ones. In New York they want everything very large; then, again, in Chicago some customers would prefer the four to the five tier, while others would prefer the five tier and pay the same price, so in that respect we cannot tell. In fact, the locality has a great deal to do with it, and the time of shipping. Every locality has its advantages and disadvantages. What would be advantageous to Marysville or Sacramento would not be advantageous to our section of the country. You can raise fruit and sell it at a big profit, which, in our section of country, we cannot think of doing. Some late fruit is more advantageous than some of the earlier varieties, but in this section of country it would be almost folly to attempt to raise it. You can raise some in this section, but I don't think it would be as profitable as the early fruit, either in Yuba or Sutter Counties. If you could send the four tier, say in the month of June, I have no doubt you could realize more than you could for the five tier; but, of course, you want to send it there as early as possible.

Mrs. L. U. McCANN: I would like to ask, Mr. Block, if you ship immediately upon picking, or do you let your fruit go through a process of ripening in your storehouse before you ship it off?

Mr. BLOCK: What kind?

Mrs. McCANN: Bartletts.

Mr. BLOCK: I would advise you to ship on all occasions immediately after picking, because you are not apt to get them there too green, and the moment they begin to show the least speck of yellow, indicating ripeness, they do not want them; that is, they would take them at a much lower price. We have much to contend with in that respect. We must pick them in the right time so that they will arrive in the East in the right condition, then you can sell them for one half the price more than if they arrived in too ripe a condition. It is a strange fact, but nevertheless true, that whenever fruit goes East in the condition just ready for use, you are apt to get nothing for it, unless it should be very scarce, otherwise you may be thankful if you make railroad freights out of it. I make it a rule to send my fruit away as quickly as possible. Sometimes you hold the Bartlett pears back two or three days and then ship them, and blame the commission men you send them to, when, in fact, the fault was with yourselves. I repeat that you send your Bartlett pears away as early as possible, and then you will be more liable to get a better price for them, because the early ones are more generally in demand, while the longer you wait the less you will be liable to get for them.

C. H. ALLEN: Does the pear ripen more rapidly on the tree, or in the bright sun, or gathered up, or put in a very cool shady place in piles and covered? I pick my Bartletts, pile them away, and cover them, and ship them much later. I am two thousand feet high, and I get a very good price. I did that by keeping them in a shady place. I thought, and still think, they will keep better picked and put away in a shady place than by hanging in the bright sunlight on the trees. I may be mistaken. Would they have kept better and lasted longer on the trees than picked and covered?

Mr. BLOCK: I think not. I would pursue a different course by putting them into refrigerator cars. I would rather do that than take chances keeping them here. You have a higher elevation and, consequently, can keep them better than we can. Now, in connection with that, I may say this: the Beurré Hardy, which is a very profitable pear, and I think it is better than the Bartlett, I can keep for three or four weeks before ripening; but you take the same pear and send it East in an open car, and when it arrives there I do not think you will get two bits a box for them. The change of temperature has a decided effect on them. Leaving here in a temperature of 80 degrees, and then going right into a country of 90 or 95 degrees, rots them right away. It seems to be the peculiarity of that pear.

QUESTION: What is the true sign the early peaches take when they are ready to ship?

Mr. BUCK: All signs often fail. There has been quite a revolution in the shipment of fruit from California within the last few years.

Q. Is there a difference whether you ship in a refrigerator or in a ventilated car?

Mr. BUCK: If you ship in a refrigerator car your fruit should be much riper than in a ventilated car. For a refrigerator car, I think, the peach

should lose the fuzz, and get the clear, transparent skin just before it commences to soften. The peach should not be at all soft on any part, even on the ridge; the nearer you get it to that the better, even for a ventilated car; but if for a refrigerator car you can even let them go beyond that, it is still better. I will say further, that oftentimes the same thing is not true of one car that is of another. If a ventilated car, especially, strikes over into the Missouri River Valley in hot, sultry, rainy weather, it is almost absolutely certain to arrive in any market in a poor condition; if, on the other hand, you have bright, clear weather, the same fruit will carry through in good condition.

MR. BLOWERS: Some people think that the electrical disturbances do not injure our fruit.

MR. BUCK: Of course, I cannot tell that; we only get our information by telegraph of a storm, whether rainy or sultry, and, of course, we do not get any definite information as to electric storms, except what we glean from newspapers, consequently it would be very hard to give you any information in that respect.

MRS. McCANN: I would like to ask Mr. Block to give us a list of the best late pears of the coast region.

MR. BLOCK: Well, at the present time, the Winter Nelis. In some sections they are the best to raise, if they are not smutty. Some places they are raised too smutty, and to the people living in those sections I would advise not to grow them. Nurserymen start out with four or five varieties for every one to grow. Now, you want different varieties, so that they will come in at different times, and then everybody will not be picking and shipping at the same time. If everybody sends them on at the same time, why, the railroad gets the profit. You have to study pretty hard. This is a kind of gambling business. The idea of every one planting the same thing is wrong. I have for the last two years attempted to introduce new varieties, and I went to a very great expense in importing the Beurré Clairgeau, and after awhile I may be able to get three or four new varieties.

MRS. McCANN: I would like to ask if you had any experience with the Winter Seckel, or Louis Bon de Jersey, a pear that ripens after the Bartletts. It is a good keeper, very luscious to eat, but too large; it is very handsome. How do they compare, or have you tried them, and also the Kiefer Hybrid?

MR. BLOCK: Kiefer Hybrid comes in a little ahead of the Bartlett. It is a good pear; I will not attack its character at all, but I will simply discuss it as far as the profit is concerned. It will ripen a little before the Bartlett. If you send it East and it comes in contact with the Bartlett side by side, you will not get as much for it as you will for the Bartlett. The Louis Bon de Jersey, of which I had a great many some few years ago, I think is a very good pear and very prolific. It is one of the best bearers we have, and you can make them large by thinning them sufficiently; they are rather small, because they grow in such large clusters. I have grafted all of mine over, for the reason that I had to ship them by slow freight on the railroad, which took from seventeen to twenty-one days, and of course they would not stand the journey. I indorse what Mrs. McCann said in reference to its quality. But things have changed, and last year I set out two hundred trees, as I want to make another effort on that old favorite. I am going to try it, but I am not prepared to advise under the present condition. Now,

if I want fruit to supply to my customers right along I can depend on the Louis Bon de Jersey. There is another advantage of the Louis Bon de Jersey, it will keep on the tree a long time, but how late it will keep I do not know. Regarding the Winter Seckel, I think that it is one of the finest pears that grows. In some sections it grows to a blackness, spotty and scrubby. It either bears too much or not enough. If they bear heavily you have to thin them out considerably. I have a good location for Winter Seckel, I am satisfied, and at the same time people living north of me I would not advise to plant, but probably south I would, on account of the mild climate.

MRS. McCANN: My experiment upon my pear trees was a perfect success. They were eaten in on one side by the blight. I applied lime, sulphur, and salt, and my fruit took the premium at the Agricultural Fair, as being the largest Seckels and the largest Winter Nelis that had been grown in Santa Cruz, and perfectly free from blight. I should like to ask what experience you have had with the Kiefer, Logan, and d'Anjou. The d'Anjou is a pear just ripening on my place; it is of medium size—about the size of the large Winter Nelis—a clear, green pear.

MR. BLOCK: I will say that locality has something to do again; you have a great advantage in raising the d'Anjou, if you can keep them on the trees at the present time. I had to pick mine in September because they were falling off, or else lose them. If you can raise them so you can keep them until the first of November, I say plant them as a winter pear. I had to pick mine two months ago, and if I had them now I suppose I would get a pretty fair price. I certainly recommend you to plant the d'Anjou under the circumstances. The Kiefer I do not keep at all; it has a very poor, insipid taste under the best conditions; it has a taste like a quince, and is not a heavy bearer either. I do not think they are good at all, and I will not plant any more of them, because they come in too early; they crowd me and they fall off.

MR. ALLEN: Do you think there is a difference between our Kiefer and the Eastern?

MR. BLOCK: The Eastern pears are a great deal better than ours.

MR. ALLEN: Why I asked, they insisted in the East that the Kiefer was the best pear they raised. I have never seen one yet anywhere fit to eat, and I agree with you entirely, it is more of a quince than a pear.

GATHERING FRUITS.

MR. BUCK: The next thing on the programme to be taken up for discussion is the subject, "The proper time to gather the different kinds of fruits; the thinning process, etc.," and perhaps it might be well to take in "The best varieties of different kinds of fruits to meet the wants of consumers in different seasons."

C. F. WYER: May I ask one question, and that is in reference to the time when you should pick Royal apricots? Now, there must be some condition in which they must be before picking them.

MR. BUCK: The age of the tree has a good deal to do with that. Royal apricots grown on old trees you can pick to a nice yellow, and they will carry safely.

MR. WYER: What do you say to a tree about six or eight years old?

MR. BUCK: The apricot will never color on the inside until it begins to ripen on the outside. If apricots are picked from old trees, my experience is that they will carry safely; they want to be nicely colored.

F. A. KIMBALL: When do you pick the Winter Nelis pear?

MR. BUCK: They generally ripen early, and I have picked them from the middle of September until as late as the sixth of November. I like to keep them as long as I can. There is no positive rule to go by. A good time to pick is when the foliage is just beginning to turn yellow.

J. L. MOSHER: Do not pears keep better where they are not irrigated? I would like to ask Mr. Block if he has ever experimented with fertilizers, and would they have any effect on the pear as to its keeping qualities—for instance, iron, sulphur, and phosphates?

MR. BLOCK: To the first point I wish to dissent from, that irrigated fruit will not keep as well as non-irrigated. My experience has been to the contrary. The irrigation of trees is beneficial, but it must be carefully attended to; you cannot allow your ground to become dry and then go and irrigate it, nor can you irrigate your ground and let it lie. If you irrigate you can leave your fruit longer on the trees than without irrigation. Now, in regard to fertilizers, ascertain what your land needs. As to picking early, you will find that if you irrigate, watch your foliage, and leave your fruit until it begins to change, you may have plenty of phosphates in your ground without any additional fertilizing.

R. P. McGLINCY: I would like to ask Mr. Block, in speaking of irrigation, if you make any distinction between what you call winter irrigation and summer irrigation; when winter irrigation leaves off and summer irrigation begins?

MR. BLOCK: Last year we did not need to irrigate at all in the winter, and I believe in winter irrigation particularly. I believe if people would take the water when it is running out of the creek that that would be a good time. I have depended on summer irrigation and put water on when I wanted it. I have taken it off of my Bartletts this year. I find that it swells out the buds, but I will probably have a good crop next year. I irrigate when I have taken the fruit off, and the early fruit I irrigate.

MRS. McCANN: Does it not deprive the trees of their necessary period of rest and recuperation for the next year, to urge them at once into the swelling of buds by irrigation, which rest they get in colder climates?

MR. BLOCK: Well, I have found no injury from it up to the present time, and I do not think it does, because I find, after all, my trees will let up for about two or three months, until, say, the first of March, and rest; and that seems to be all the rest they need. I have gone to considerable expense, and have got land that has cost me a good deal of money, and I want to get all I can out of it; and when I am gone it may require additional assistance, so I will let others after me work as hard as I did to make it up.

MRS. McCANN: I notice some of the largest fruit growers in Missouri advocate giving the pear orchards absolute rest after the trees are six years old. They say it is money in your pocket.

CO-OPERATION AMONG FRUIT GROWERS.

MR. McGLINCY: I am a new hand in the fruit business, and I do not know exactly where to start or how to start in order to make the best of it. We have been discussing in our little horticultural society for some time past the advisability of a "Dried Fruit Exchange." In Sonoma County they have also been discussing this project, and recently General Chipman has suggested the advisability of establishing a commission house in England for the sale of California dried fruit. If we could form a State organization in California, with branches in various counties in which the fruit industry will warrant it, we might have a Dried Fruit Exchange, and might thereby induce Eastern dealers to make their purchases therefrom. Whether such a feature as that is feasible or not, I am not prepared to say at this time. I have no fault to find with the commission merchants in this or any other State. The commission merchants of California have done the fruit interest a great deal of good in years past; but has not the time come when the fruit growers—I mean men owning an orchard and toiling from fourteen to sixteen hours a day in cultivating, and gathering, and taking care of the fruit—should take the matter in their own hands and market their own fruit? If it is, then it is time that this Convention should adopt some plan whereby those of us possessing a small number of acres might be able to get more for our labor in the future than we have been getting in the past. Those of us engaged in drying our own product will be glad, indeed, to have an organization of that kind, whereby we could meet the Eastern dealers as they come through this State gathering up the crop for the Eastern market, and show them what we have.

MR. BUCK: I am hardly prepared to go to that extent, for the reason that I think it is impracticable. I have made two or three attempts in this State to organize Dried Fruit Exchanges, and I believe they have not been a success. In regard to coöperation, I think that is correct; and it is more correct in regard to the handling of the green fruit crop than the dried crop. The dried fruit can be held, but the green fruit cannot; you can keep your dried fruit till the buyers come, or you can send it to some place to be sold; but the green fruit must be marketed the day you pick it, or you will lose it. There have been quite a number of instances of coöperation in this State for the purpose of disposing of the green fruit product, and they have been, in every case that I know of, very beneficial. It educates people to prepare their fruit in the proper manner, and becomes very instructive. If one gets a higher price than another, they certainly try to find out why it was so. There is only one trouble with a generous and hearty coöperation, and that is the unnatural jealousy that always exists among farmers and horticulturists. I have been manager of the California Fruit Union for six years, and consequently I have had considerable experience with coöperation. There have been a great many small sections that have clubbed together in some shape and loaded cars, and have been shipping them forward, through some State organization, to some central point, and while the result has not always been good, I believe they get fairly good money. This season has been a year of low prices, and those who have shipped East have fared no worse than those who have sold on the Pacific Coast. Without doubt the fruit crop, green or dried, if it could be held and sold under some one head, would bring more money. I am not thor-

oughly conversant with the work of the Dried Fruit Association, which was started some two or three years ago, but my general opinion is that it did very little business at a considerable expense, and that the results were anything but satisfactory. They now have, I believe, in Santa Clara an organization of that kind, and perhaps some one from there can tell us more than I can. I know that the larger portion of the dried fruit crop in this State has not been handled by any Dried Fruit Association, and unless they can have more of them, certainly they cannot be of any practical benefit. But when it comes to coöperation, I certainly favor that in every instance, and the larger the coöperation the greater benefit it will be.

MR. ALLEN: I was Secretary of an organization where some two or three hundred growers agreed to form a California Dried Fruit Association that was to handle and dispose of the fruit. They paid their assessment of \$1 per acre, and formed the organization, paid reasonable salaries to officers, and went through one year of its existence. That one year absorbed all the stock that had been paid in, and a little more, so that there had to be an assessment levied to help to pay up the salaries, but I think I was one of the four out of the two or three hundred who sold through the association, and the rest sneaked around to try to get ahead of the Dried Fruit Association to see if they could not do a little better, and the result was a most lamentable failure. I entirely agree with what Mr. Buck said, that it is entirely impracticable until men will come out like men, and stand right up to their promises. I believe it can be done. If we had in our Santa Clara Valley this year a good, strong Dried Fruit Exchange, it would have saved a few millions of dollars in money, and the lack of this organization has compelled every drier—and hundreds of farmers have dried this year who never dried before—to market his own fruit. Now, the farmer who has very little capital must sell his fruit immediately, for he has men to pay, and other necessary expenses to meet, and the result is the fruit has been sold for about one half what it is worth, as a matter of necessity. If there had been a strong Fruit Exchange, you could have had that fruit graded and sacked, and could have issued warehouse receipts for it at an advance of 2 cents per pound; there would be no risk whatever, and the pressure that the poor farmer experiences would be relieved. I think the time has come when we must have a Fruit Exchange, but how it is to be brought about is another question. It will have to be done, or we will be completely buried. Men who are buying and have laid out large orchards must have ready money to pay their current expenses, and unless there is some relief they will be compelled to sell their fruit at a great sacrifice. I think you could have one here, and in Sonoma and Napa. We can demand a reasonable price when we are organized.

MR. BUCK: There is also a difference between the dried fruit rate and green fruit, between carloads and fractions of carloads. These local organizations, I think, have been more than successful wherever they are working, and I think they should work in connection with some State organization, say at Sacramento, for instance; and I have no doubt but it would prove beneficial. But dried fruit is different from green fruit, and there are but few men who make the same variety who put it up alike, and there is a great variety of it; consequently it has got to be handled in small quantities, and mixed and blended as they do wine.

MR. MOSHER: I was one of the members of this Dried Fruit Associa-

tion, and one of the greatest drawbacks was the grading of the fruit. Of course, every one who dries fruit thinks his fruit is the best. Now, if we were to send this fruit to be graded there must be judges to decide. First, it was thought best to sell fruit by samples, but they found that to be impossible. The fruit was put up by the various parties differently; some, for instance, would dip their prunes differently from others, and that would necessitate the appointment of inspectors to decide whether it was first, second, or third grade, and we had a very hard time of it. We discussed that matter, and also the kind of packages we put it up in, and we seemed to lose interest in it then and there. None of us seemed to agree as to how we should handle the fruit, and I think it died right there, while we were discussing that part of the business. I wish there was some more staple way of handling our dried fruit. At the present time it is almost like a gambling arrangement.

MR. McGLINCY: Professor Allen said a great many growers dried their own fruit. I do not know but what three fourths dry their own. In my own neighborhood they were obliged to sell; they must have the money, and they did sell their prunes early in the season at a lower price. Those of us who could possibly keep our heads above water until the present time have made over \$10 to \$20 more on prunes than our neighbors who were obliged to sell or go under. It is to help those people that we should encourage this Dried Fruit Exchange, whereby they may be able to better their condition. I believe there is enough of the milk of human kindness in some of us, at least, to try and help our neighbors who are trying to help themselves, and while we are helping them we are really helping ourselves. By this system we can educate the newcomers and some of the old timers too, who do not know it yet, so that they can have a uniform grade of fruit, and when we say this fruit has been graded and offered for sale by the San José or Marysville Dried Fruit Exchange, dealers will in a very short time know the brands of the fruit and will be very willing to trade with the association. The dealers soon learn that the fruit is what it is represented to be.

MR. MOSHER: I had a large amount of peaches I asked 20 cents a pound for, and which I considered very nice. I considered them worth that, so as to be able to make a fair profit. I was offered 15 cents, but I held out for a higher price. I sold that fruit for about 10 or 12 cents a pound this spring. I held the fruit four or five or six months.

MR. SAUNDERS: As you were speaking of coöperation in handling dried fruit, I think, perhaps, it will be of interest to the Convention to know of a little movement begun in Santa Clara County in a small way. I think a multitude of small organizations is better than to have *one* that would cover the whole State. There were a few of us in a little obscure district who wanted to know more about the business we were engaged in. We organized a club, called it the Horticultural Society, and held our meetings in the school house, and we would talk of subjects that concerned our industry, and taking into consideration that the California Dried Fruit Association had made a failure, we concluded that that was the wrong way to begin; that in making a pyramid it was best not to try to stand it on the apex, but to begin at its foundation. Along last winter some time, there was an organization in San José calling itself The Buyers and Driers' Association, and looking forward to the

coming fruit season they naturally wanted to buy a little fruit by contract, so they formulated a contract and distributed it around the county among the different producers. Our little society took it into consideration, and began to pick it to pieces, and we thought there were some conditions that were rather hard. We did not want to go on until the fruit crop was ripe and ready to be gathered, and then take chances to be able to sell it to those who were buying for canneries, as they might reject a great portion of it, according to that contract, if it was a little overripe. We were not going to be caught in any trap of that kind. We got together and provided a method by which we were able to dispose of our fruit without depending upon such buyers. We called a public meeting; the animus of it seemed to be the indignation felt against these contracts, and we considered it an outrage upon the producer. At this public meeting we formulated a plan of what should be done. We explained the situation to the committee, and that committee had not been out more than an hour when they returned with the proposition to organize a coöperative corporation, with \$100,000 capital, shares to be sold at \$25 each. The object of it was to have a packing house, where we could do the grading. The quality of the fruit was good, and prunes ran very uniform in size and quality. At another meeting we appointed our committees and formulated our articles of incorporation under the laws of the State, appointed a building and various other committees, let out a contract to put up a packing house; but it turned out that a great many would not take stock. We built a drier and packing house about three or four miles from Santa Clara, and those who were not already preparing it home were able to haul their fruit there and have it disposed of by the company. We selected certain agents to take charge of the selling of the fruit, and I supposed it would have amounted to something in the near future. But I think it would be better to do away with the agents than to let it go through so many hands, but the agents seem to be getting a good return this year. Now, that is a sample of what might be done in a great many of the neighborhoods. If, after a number of these associations start and get into working order, they can combine through some produce exchange, and sell through some of these channels, it would be greatly to the fruit growers' advantage. There has been some dissatisfaction. When some of them hauled their prunes there they rattled pretty badly, and some of them were a little under-done.

MR. BUCK: I would like to ask you how much stock you sold?

MR. SAUNDERS: Six or seven thousand dollars' worth.

MR. BUCK: Is that all the capital you had?

MR. SAUNDERS: Yes, that was all we had. The plan was that our agents would pay for the fruit F. O. B.

QUESTION: Have they handled other fruits besides prunes?

MR. SAUNDERS: Prunes, apricots, and peaches.

MR. STABLER: I recollect in a meeting of the Dried Fruit Union I used this language: "That the State ought to have an agency and warehouse, clerks and foremen, and that this warehouse should be conveniently located, and have a large number of receptacles, such as bins, and when a lot of fruit came in, even the smallest lots, never mind the quality, just give the person bringing it in a general credit. Then after the grade was made, give a specific credit as against the general credit of a different kind of grade." But there were men who were

paid salaries, and that necessitated the assessing of members, and whatever the association had on hand the salaries and office expenses and rent eat it up.

RECESS.

MR. ALLEN: I move that this Convention adjourn, to meet at 9 o'clock A. M. to-morrow.

Motion carried.

TRANSACTIONS OF THE SECOND DAY.

WEDNESDAY, November 18, 1891.

MR. BUCK: The Secretary will read a communication from President Cooper:

SANTA BARBARA, CAL., November 18, 1891.

B. M. LELONG, *Esq.*, *Secretary State Board of Horticulture*:

DEAR SIR: Please state to the Fruit Growers' Convention that it will be impossible for me to be present. I have, on account of the late ripening of fruits, been pushing the gathering, mainly that I could attend the Convention. This overwork and anxiety, in addition to the literary work in other directions, and mental excitement, has overtaxed my powers, and left me in a nervous condition that needs quiet and extreme care.

Since I have been honored with the presidency of the Board I have not lost a meeting, and have presided at every Convention. It has been the great pleasure of my life, and now that I cannot be present is extremely hard to bear.

Present my regrets, and believe me very truly,

ELLWOOD COOPER.

MR. BUCK: I would state still further that I have received a letter of the same character.

MR. BLOWERS: I move, Mr. President, that the letter of Ellwood Cooper be answered by the Secretary, expressing the regrets of this Convention that he was not here to assume his proper place.

Carried.

HORTICULTURE IN DEL NORTE COUNTY.

By JOHN H. FOWLER, of Santa Rosa.

Del Norte County is situated in the northwest corner of the State, its northern boundary being the southern line of Oregon. The Pacific Ocean forms the western boundary of the county. No railroad penetrates the county from the outside world. If one wishes to reach it by land, he can travel by rail to Grant's Pass, Oregon, thence by stage to Del Norte; or he can take the ocean route by steamer to Crescent City.

Its chief industries are lumbering and dairying. It contains about one million acres of land, more than one half of which is unsurveyed government domain, and a very large portion of the whole county is timber and mountainous land. The portion suitable for cultivation is very limited, and is found mainly in Smith River Valley and the country adjacent to Crescent City, and this area is principally devoted to dairying. About two hundred thousand acres of the county belong to the timber belt. The timber consists mainly of redwood, spruce, and fir. Del Norte is the chief source of supply of spruce lumber for San Francisco.

Horticulture, as usually understood, has been kept in the background, and overshadowed by the other leading industries, and its development delayed largely by the comparative want of accessibility. Dwellers in

this section, however, are confident that they have both the soil and climate that will ultimately show excellent results in this department of agriculture.

The soil of the open arable land is a rich, dark, sandy loam, easily cultivated and retentive of moisture, while that underlying the forests is principally of a clayish character.

It is generally believed that soil that will grow giant redwoods and firs from ten to fifteen feet in diameter and three hundred or more feet in height, is capable of doing something grand in the line of fruits that shall excel in size, flavor, and quantity. Experiments that have been tried seem to verify this prediction; and as the saw-mills consume the forests they will be followed in due time by the fruit grower, and the land which from time immemorial has lain in the deep shadow and chill of the mighty forests, will be warmed into fruitfulness by the power of summer suns, and bring forth bounteous harvests.

The moist climate (the annual average rainfall being considerably in excess of that of San Francisco) and sandy loam especially favor the production of berries of all kinds, and it is predicted that great success in this line of fruit growing will be attained when better facilities for transportation are obtained, and the industry shall have been encouraged by the establishment of canneries.

Thimble-berries, two varieties of salmon-berries, two kinds of huckleberries, strawberries, and blackberries are indigenous to the soil. Where raspberries, strawberries, and blackberries are cultivated they yield immense crops, and with much less care than in most other places. I am told that a small space set to Red Antwerp raspberries was taken possession of by the canes, and afforded abundant crops year after year without cultivation, only requiring the removal of the old canes. Currants find there the conditions of soil and climate just suited to their culture.

It is claimed for the apples of Smith River Valley that they are superior to most of the California-grown fruit, and resemble those grown in Oregon. Pears also do well.

Plums do especially well there, and will eventually afford the horticulturist a profitable field for investment. The trees grow with remarkable thrift, and yield in great abundance large, fine fruit.

Peaches do not seem to thrive along the coast, but on the Klamath River, where the Indians have raised trees from the pits and suffered them to grow under the most careless culture, it is said that excellent fruit has been obtained. There is, doubtless, a large area of the interior of the country where peaches will flourish.

Judge Murphy has planted olives on his ranch a few miles from the coast, and reports a thrifty growth. Grapes are grown successfully at Gasquet's, on the upper waters of Smith River.

REPORTS OF COMMITTEES.

PRESIDENT BUCK: We would like to hear the report of any committee that may be ready.

COMMITTEE ON COOKE MONUMENT.

MR. JOHNSTON: Some time ago I was appointed on a committee by your Convention to devise some means by which a suitable monument could be erected to the late Matthew Cooke, who is, perhaps, entitled to more credit than any other man in California for discovering what we call the "fruit pests," their habits and their origin, and, perhaps, some of the best ways of exterminating them, and it seems to have gone almost by default. At what I supposed was the proper time—during the summer—as I was Chairman of the committee, I addressed a note to each member of the committee, requesting him to take steps for a certain length of time, naming it in the note, and reply to me what his success was, with a view to calling a meeting of the committee at some central point, where we might take action. Now, the Convention either made a mistake in appointing that committee or its Chairman, or something is wrong, and of all the notes I sent out I received a single answer, from brother Kells, who lives near me; not a word or dot from any other member of the committee. During the session last year of this Convention at Santa Cruz there was a little subscription paper circulated and some little money subscribed, but it was not put in legal form, so you cannot now collect that money. The time has passed by when that could be collected as a formal promise, because the obligation was not written in due form. I guess I will have to saddle a little off on somebody else. I think there is something wrong about this committee, something wrong about the manner in which they proceed in their business, because if there was anything that this committee ought to do, or any organization ought to do, or any body of men or women ought to do, is to remember their efforts. If Matthew Cooke has not proved a fruit grower, who has? I do not think it becomes me to say much upon this subject at this time, but simply, this morning, I desire to resign, positively, from this committee. I will not act in the capacity that I have been doing with the assistance that I have had on this important subject; and in resigning, I ask this Convention to appoint a new committee, and take this matter with vigor and work it to a success, and I will be one who will subscribe with my means and will assist that committee to do what ought to have been done a year ago. This matter should not be neglected, and you will find me assisting that committee, but positively not as a member of it.

MR. LELONG: Mr. President, I think Mr. Johnston has worked so long and faithfully on this committee, and has received so little support; that he is feeling somewhat despondent. I do not think he ought to give up, because he has worked so hard in this matter, and I know he understands it better than anybody else here. Mr. Johnston has been a very close friend of the late Matthew Cooke. At the Convention held at Santa Cruz a year ago a committee was appointed to collect money to purchase a monument, location, etc. From that time on the committee has been at work, but it has not met with the success it should; the fruit growers have not responded as liberally as they ought to. At the Santa Cruz Convention Mr. Johnston presented a report of progress, and also stated the difficulty he had in obtaining funds necessary. I then suggested that as good a way as any would be simply to pass a paper around and have the fruit men place their names upon it and the amounts opposite their names that they would be willing to subscribe.

I do not think, though, that the money cannot be collected, because I do not believe that any person who put his name to that paper would refuse to pay it, if called on to do so.

MR. JOHNSTON: I move that the committee be discharged and a new committee be appointed. Carried.

MR. BUCK: Now, if there is any disposition of the fruit growers of this State to do anything toward the building of a monument to be erected over the remains of Matthew Cooke, now is the time, or let us say that we do not wish to do it. I will certainly appoint Mr. Johnston, because I do not know of any person who can or will do better than he can, and I am at a loss whom to name for the balance of that committee. It is certainly something that the fruit growers of this State owe to Matthew Cooke.

COMMITTEE.

The President then named Mr. Johnston, of Courtland, Mr. McKinley, of Los Angeles, and Mr. Kells, of Yuba City.

INSECT PESTS AND REMEDIES.

HYDROCYANIC ACID GAS TREATMENT.

By N. H. CLAFLIN, of Riverside.

As the treatment of fruit trees infested with injurious insects by exposing them to the fumes of hydrocyanic acid gas is receiving considerable attention in the southern part of the State, I have prepared a short statement of our methods of treatment, hoping to interest you in them, with the expectation that you will be able to use the gas, on deciduous trees as well as citrus, *with better results* than spraying, and with but little more expense, because one gasing will kill more scale than two sprayings, and with less injury to the trees. First, let us consider the application of the gas. A tent large enough to cover the tree is required. This is usually made of eight or nine-ounce denim, or eight to twelve-ounce duck, and is sized with glue sizing, or some preparation to close the spaces in the cloth and keep the gas in. Beeswax, starch, yellow ochre, and lampblack, mixed with a small proportion of oil, have been used; so, also, has rubber paint. It is now considered preferable to paint on the *inside*, and leave the outside light color. It is thought that the tents will be used somewhat by daylight, instead of after dark, as has been heretofore done, and that in such case the light color outside will give less heat within the tent. It is questioned by some, who have had considerable experience in the actual work of fumigation, whether it is the "actinic" rays of light which cause the injury to the tree, or if it be not because of the heat within the tent.

The size of tents vary from eight to thirty-six feet high, and from six to twenty-eight feet in diameter. Tents sixteen feet high, or less, can be put over the trees by hand, by using a half inch gas pipe around the bottom to distend it, and raising the bottom of the tent, by tipping this

hoop at an angle of 45 degrees, then raising it over the tree. Larger tents need a derrick or tripod to raise them with. Various devices are used for this purpose. Each orchardist can easily arrange for this, using as a guide the published descriptions and plates representing derricks.

The gas is generated by putting water, sulphuric acid, and cyanide of potassium together in a glazed earthenware vessel, which should hold from one gallon for small trees, where four ounces or less of cyanide is used, to four gallons for large trees, requiring one half to three quarters of a pound of cyanide. The quantity of water required is placed first in the generator, and it is then put under the tree eighteen inches or two feet from the body and the tent lowered over it. When everything is in readiness, the acid having been measured into a glass or earthen pitcher and the cyanide weighed into a tin cup, one man raises one side of the tent and another pours the cyanide first into the generator, then the acid, and immediately backs out from under the tent. Some use a wet barley sack over the generator to prevent the spattering of the chemicals onto the tent; it is also supposed to favorably modify their action on the tree, and render it less liable to be burned by the gas. The proportions of the chemicals generally used are: One ounce of acid by measurement to each ounce of cyanide by weight, in two ounces of water, or one part each of acid and cyanide and two parts of water. Some of our foremen use more water and less acid; as, for every five ounces of cyanide, four ounces of acid and fifteen ounces of water. Mr. Henry Leck, of Tustin, made a very successful test of day work by using dark-colored tents, and four times as much water as cyanide, and four ounces of acid to five ounces of cyanide. When gasing was first tried tents were left over the trees about fifteen minutes; now it is considered necessary to leave them from thirty minutes on a small tree, to fifty minutes on a tree twenty feet high, or larger than that. Dr. Dunn, of Pomona, is using about thirty tents of different sizes, and treating successfully all kinds of scale on deciduous trees as well as citrus.

In San Bernardino County some tests have been made on pear trees for pernicious scale, killing all the scale the first fumigation. The black, or olive, scale has been entirely killed on deciduous trees by once fumigating. The most of the work done has been on orange and lemon trees. Once fumigating will kill all the scale of every kind, and do no injury to the fruit or tree. The work in Riverside is done in this way: Inspection is by the county; every tree in an orchard is examined about once in six months. The Inspectors are able to find the scale, even when there are less than a dozen on a tree, whether a large or small tree. Whenever any tree is found infested it is marked with a crayon, or lumber pencil, the owner is notified of the find, and directed to have it cleaned within a specified time. A plat of the orchard is also made by the Inspector, locating the infested tree or trees, and sent to the Horticultural Commissioner in charge. The city owns six large tents and some small ones, and employs a Superintendent of Fumigation to care for them and manage the work done by them. He is also notified by the Commissioner whenever fumigation is required. He is furnished with a duplicate of the plat of the orchard, showing the number and location of the trees infested. Usually the owner employs the city apparatus, and the accompanying blanks are used: No. 1, Agreement; No. 2, Fumigator's Report; No. 3, Time-book. Thus the Superintendent, as

well as the Horticultural Commissioner, has a complete record of the scale found and treated. Its location in the orchard and the record of its treatment is a guide to future inspections, and an aid in learning the efficacy of certain doses, etc., for trees of a given size.

Eternal vigilance is the price of liberty; it is also the price of clean trees, and you must exercise it in your own orchards and neighborhoods, if you make a financial success of fruit raising. It must *begin even before you begin your orchard*. Agents of Eastern firms are contracting to deliver diseased trees to you. Unless you exercise "eternal vigilance" and keep them out, your hopes and prospects are blasted from the very start.

The Horticultural Commissioners of the State are giving their best thoughts and work to protect and advance the fruit interests of the State. Aid them by every means in your power, and by constant and earnest coöperative effort the growing and marketing of fruit shall be made more of a pleasure and more of a financial success in the near future than it has been in the past.

DISCUSSION ON INSECT PESTS AND REMEDIES.

MR. WYER: I would like to know if we must use the best sulphur?

MR. BUCK: I do not think it makes any difference as to the quality you use, because if you use the cheap sulphur there is more sediment than in the other sulphur, so that I never could find a great deal of difference.

MR. MOSHER: I have had some experience in mixing up this lime, sulphur, and salt, and I think it is a common error we make in not boiling sufficiently. I notice that where I have boiled it for five or six hours that the sulphur is thoroughly dissolved, and it makes a chemical change. I know when I have been riding by orchards I could tell by the trees whether the wash on them was thoroughly made. I would like the sulphur dissolved so that it could combine with the sap of the tree. I don't care to use the lime.

MRS. McCANN: I think there is one benefit in using the lime, and that is, it shows where the work has been done. I would like to ask the gentleman how many times they spray with this mixture, and if he considers it to be thoroughly effectual for the pernicious scale and the codlin moth?

MR. MOSHER: I do not believe in spraying at all. I believe my orchard compares favorably with my neighbors'. I think they have sprayed too much. I merely wash my trees; sometimes I use a spraying machine. I never spray below the lower branches. I know the sap goes up into the limbs, and I think this wash combines with it.

MR. CLAFLIN: I know the sulphur remedies are the best to be obtained for spraying, but we have very little use for it. We found it necessary to spray twice to kill all the scales, and the time we prefer to have that done is when the leaves fall off in the fall and then in the spring; it is difficult to kill all the scale, for there will be some spots on the tree left untouched, although the men who are doing the work go over it two, three, or sometimes four times.

MR. BUCK: I will say that we have used the lime, sulphur, and salt wash, and found it very effectual. I was in my orchard Monday of this

week, and I could not find, nor did find, a single live scale, nor did I see a scale in the sample of fruit that came out of our orchard this year. In answer to Mrs. McCann's question, I will say that lime, sulphur, and salt do not affect the codlin moth materially; but if the lime, sulphur, and salt wash is prepared properly, I believe it to be absolutely a sure cure for the pernicious scale. I do not agree with some fruit growers; I believe the lime has something to do with it, and I believe that the assimilation of the lime with sulphur is the thing that kills them.

MR. MOTHERAL: We boil the lime and sulphur together until they thoroughly unite and the liquor becomes an amber color; then we add more lime, sulphur, and salt for the purpose of making the whitewash, and stick it on the tree. My theory is that the last addition does not amount to anything, but it must be boiled. I have experimented some at different periods of the year in Tulare County, where they do not now have scale. Three years ago they destroyed our trees until our fruit orchards had almost disappeared; now our orchards are all clean, and we have adopted this plan of spraying—just as soon as the leaves fall. After that period the parasites live upon the pernicious scale, which are in the ground, and not upon the trees at all, and these bugs are in the ground housed for winter, and if you wait until February they are out and on the trees and laying their eggs preparatory to their work in the spring. If you spray with lime, sulphur, and salt it ought to be done in December, and if you do that you will have no scale.

MR. BLOCK: I believe in using lime, and a good deal of it. I find the I X L Santa Cruz lime is about as good as any. It is not the finest for house use, but you want caustic lime—as caustic as you can get it. I would suggest that you put in your salt and sulphur together, as it will dissolve much quicker.

MR. GRAVES: I would like to know what success has been had with the I X L wash. I have read that it has not been a success.

MR. CLAFLIN: In Southern California we have given it a fair test, and it has been proved to be unreliable; in some cases it did the work, but in most cases it did not.

MR. GREEN: I differ with some of the gentlemen in regard to the sulphur used. I experimented last winter with the California sulphur, the Eastern sulphur, and the French sulphur. I tried the California sulphur on a hundred pear trees, also a hundred trees with the Eastern sulphur, and a hundred trees with the French sulphur; the result was the trees sprayed with the French sulphur had less smut on them.

MR. ALLEN: A good many years ago I did know something about chemistry, and if we understood the manner in which it acts I believe it would reconcile us in our differences. The scale is laid under a cover—not exactly gum arabic, but something like it—and while it is thus protected no wash put on the outside that does not dissolve that cover, or loosen it up, will kill the egg. Now, the purpose of the lime, I take it, is to dissolve the mucilage around this scale, as well as to loosen them up, so that the sulphuric acid, which is the effective part of all this, can do its work in killing these insects. The virtue in killing any of these must come from the sulphuric acid of the sulphur, or from the caustic properties of the lime. Those of you who use sulphur on your grapes know it is not the sulphur that does the good, but it is the vapor that comes from the sulphur as it is vaporized through the air and disseminated for days and weeks after you put it on your vines. So it is

this sulphuric acid gas, you see, that kills all this life. Now, as to the lime wash, you have to put that on just where the evil is; but the sulphur will act three or four feet in every direction. The virtue of the whole thing comes from the gaseous substances, and the purpose of the admixture is to hold the sulphur in place, so that it does not all fall down on the ground. The whole purpose of this is to dissolve the mucilaginous covering. If you can spray at the right season, when the insects begin to move from the shell, then you can kill them with sulphuric acid gas; but you want to hold it in solution and give it a chance to slowly vaporize, as it does constantly in the air. It vaporizes very rapidly when the sun is very hot, and rises very slowly when it is cool.

MR. MOSHER: I would like to ask, when winter approaches, at the time the tree puts on its winter coating, and the scale puts on its winter covering also, if we put on anything to take off this hard shell of the scale, will it not also take off this outer covering of the tree that nature has put on it to preserve it during the winter? I have noticed that the trees that were washed did not do well, as they seemed to take on a sickly look, like a person just getting over a fever. If you wait until spring, when the sap begins to come up into the tree, then the bark is thrown off and the shell opens, and the scale begins to move, and I think that that is the time to put on your wash, for then it combines with the sap of the tree. I washed the pear trees at that time, and I noticed after doing so that the scales were all dead.

MR. MOTHERAL: I would like to ask Mr. Mosher if he tried the experiment of boring a hole in the tree?

MR. MOSHER: I have heard of it.

MR. LELONG: I can cite an instance in Los Angeles County. About eighteen years ago there was a man came around and he wanted to kill all the bugs on the trees at so much a tree. Mr. Shorb tried it on his orchard. He bored two or three holes in the tree and plugged them up, and you can go there to-day and gouge the plugs out, and you will find the sulphur in just as perfect a state as the day it was put in.

MR. MOSHER: I think it would be better to dissolve the sulphur, so as to combine with the sap.

MR. CLAFLIN: The Horticultural Commissioners and the fruit men who have given this matter the closest attention, will agree, with hardly an exception, that it is impossible to get anything into the sap of the tree, either by placing it on the outside of the tree, or by boring the hole and putting it into the tree, so that it will be conveyed so as to destroy the scale of the tree. If that is the case it must be from the work of the parasite, and not from the application of lime, sulphur, and salt.

PEACH YELLOWS.

By W. E. COLLINS, of Ontario.

The successful horticulturist is not only an observant man, but pursues his observations and experiments to an intelligent and successful conclusion. He knows the characteristics of each variety, and notes carefully every irregularity in growth or development of tree or fruit. The peach grower must familiarize himself particularly with the color

and time of ripening of the fruit of each variety, not only that he may select the varieties best calculated to produce the results he aims at in marketing by having a succession of ripenings, but to be able to detect any departure from normal conditions. "By their fruits ye shall know them." The first indication of yellows is manifested usually in the fruit; it ripens from three days to six weeks too soon, but as a rule from two to three weeks. Healthy peaches grow rather slowly till a short time before maturity. Then they increase rapidly in size, and all ripen about the same time. The diseased fruit sometimes ripens in such a way that they all ripen at once, irrespective of variety. Thus, the Early Crawford and Smock may mature at the same time. The discoloration of the diseased fruit is also variable. Instead of the delicate, minute dots or uniform mass of color of the healthy peach, it is coarsely blotched, speckled, or mottled with red and purple spots about one sixteenth of an inch in diameter. The flesh, also, of both the white and yellow varieties is mottled, streaked, or spotted with crimson to a greater or less degree. Later in the season the trees show a tendency to push out lateral shoots, especially from obscure buds on the new growth, sometimes to such an extent as to give the affected limb a tufted appearance at its extremity. The leaves, instead of being plentiful, normal-shaped, and healthy in color, are dwarfed, red-spotted, and fall prematurely. These are the general symptoms of the first year. Only a peach or two, or a small limb or two, may be found affected.

The second year there is a marked progressive development of the symptoms exhibited in the first year; the fruit is smaller and less abundant, and the pit is often misshapen. The disease affects a greater portion of the tree, often a smaller portion being free than was diseased the first season. Diseased shoots continue to grow from the affected limbs, those of the previous year, if any grew, being for the most part dead. The foliage is more dwarfed, yellowish or reddish brown; and on that affected the previous year, more or less curled or inrolled. This curling or rolling does not usually appear on the diseased summer or secondary shoots.

The third and later years are marked by the death of large limbs, and finally of the entire tree.

These are only the general symptoms to be seen as the disease progresses. Others are to be found, but are so variable that it would require too much space to enumerate and describe them so as to be of any value. I should state that in the first year the tree is not always affected, more frequently only the fruit, and it may be only two or three specimens, or the limb may also show it to such an extent that it makes no preparation for winter, but continues its abnormal growth. The diseased wood has a starved appearance and is brittle. Professor Smith gives the following

DIGEST OF SYMPTOMS.

(Page 8 of *Treatise on Yellows*, by B. M. Lelong, August, 1891.)

- "1. Prematurely ripe, red-spotted fruit.
- "2. Development, upon the trunk and branches which bear, or have borne, the diseased peaches, of secondary or summer shoots, often in great numbers and always dwarfed and feeble in appearance.
- "3. A very marked tendency of the buds on these secondary shoots to

develop the same season, forming sometimes in this way, within a few months, secondary, tertiary, quarten, and quintan branches.

"4. The appearance of the disease the next spring, in the entire growth of the tree, or at least of the diseased parts, the shoot-axes being shortened and the foliage dwarfed and sickly, of a yellowish or reddish brown color, and with a greater or less tendency to curl from end to end and to roll sidewise, so that the lower surface becomes the convex outer surface. Sometimes, however, the disease affects the terminal shoots the same autumn, causing the winter buds to develop either before or after the leaves have fallen.

"5. A slow progress of the disease from limb to limb, so that in one or two years, or at the most three years, the whole tree is involved.

"6. Coördinate with the progress of the disease from part to part, a marked diminution of the vitality of the tree, ending in death.

"These are symptoms characteristic of peach yellows, and they seem to me quite as definite as those of any specific disease. If peach yellows, as I have seen it and defined it, is not a specific disease, due to some constant cause or causes, then neither is glanders nor anthrax nor measles nor smallpox."

ITS CAUSES, REMEDY, ETC.

We would indeed be happy if the cause of this terror of peach growers could be as easily ascertained and narrated as its history. The remedy would then be at hand, and with a careful application certainty of effect could be counted on, and the grower rest easy that his income would not be decreased materially. Unfortunately, however, like our unnamed vine disease, it has baffled all scientific and practical effort to determine its cause or prescribe a remedy. Years ago it was frequently mistaken for other diseases, notably, borers. Many writers have attributed its cause to soil exhaustion, others to climatic causes, floods, droughts, frosts, etc.; others, again, to excessive cultivation or pruning, neglect of both, injuries of various kinds, defective drainage, propagation from buds rather than from seeds, use of animal manures, micro-organisms, etc., but Professor Smith, from his experiments and investigations, seems to have satisfied himself, at least, that all these hypotheses must be barred. And from personal correspondence with leading horticulturists in the Eastern States, I am led to infer that they coincide with Professor Smith's views.

But in the face of these views held by such able and experienced men, I think the theory of soil exhaustion and in-budding has not been disproved, and I will attempt to explain: In cereal crops we know the best results are produced by a rotation of crops, because if a succession of the same crop be grown on the same land, it results in a decreased yield through exhaustion of the soil. If a tree be planted, it remains in the same spot until removed, and there is no rotation possible. The roots soon take up all the nourishment there is in the soil for tree growth. The only possible opportunity there is for it to get plant-food is by the extension of its roots and rootlets, or from application of manures in some form—in time the roots of adjoining trees interlace; thenceforward the growth must be largely made from artificial applications. Now, here is one point. There is nothing so fully imparts to the soil all the requisites of plant-food as natural manures, but the supply is limited;

hence, resort must be had to artificial products. The soil, plant, and fruit are analyzed in order to determine the component parts that are to be supplied in greatest quantity for the particular purpose, but analyses are misleading. We know, for instance, by using certain proportions of oxygen, hydrogen, and carbonic acid gases water can be produced. We also know an expert chemist can analyze Portland cement, and by using exact proportions of the same ingredients determined by his analysis fail to produce Portland cement, because one ingredient is entirely eliminated by heat in the process of manufacture of the genuine article; hence, cannot be found by an analysis of it. So in soil there may be an essential chemical agent which is not discovered by analysis, but which is necessary to the production of a proper fertilizer.

Again, soil exhaustion may be, and undoubtedly is, brought about more rapidly by overbearing, especially in young trees. This is a characteristic of budded or grafted trees. In the early history of the disease, the trees were all seedlings and it made slow progress. With the advent of propagation by budding, it spread more rapidly and attacked younger trees. This may be accounted for in part by the buds having been taken from trees which, at the time of taking them, exhibited no external signs of the disease, but more recent experience seems rather to disprove this theory. Budding dwarfs the tree, causes the wood to mature and bear younger than the seedling stock would, which results generally in precocious bearing, hence a deterioration of vitality, which, coupled with soil exhaustion proper, renders the tree more susceptible to attacks of disease.

Professor Smith, while acknowledging that in-breeding has been established as a cause of deterioration in animals, discredits the theory that the same law or the prolonged reproduction by buds, or in-budding, has any effect on plants or tree life from the difficulty of deciding what constitutes an individual. But it seems to me, analogously, they are the same. It seems reasonable to suppose that if a bud be taken from a perfectly healthy tree and inserted in healthy stock, and again from that tree buds are taken and inserted on other stock, and so on indefinitely, while the characteristics of the fruit will be preserved, and its quality maintained by cultivation and other means, it must result in the vitality, or longevity, being gradually depreciated. Then couple with that the method widely practiced of growing stock for budding purposes from seed gathered indiscriminately from culls, windfalls, or budded fruit, and we have a result that cannot but be fraught with bitter disappointment. Professor Smith practically supports this theory by stating that young budded trees are more quickly attacked and more readily succumb than old seedlings. To avoid this it is necessary from time to time to go back to the parent tree for buds and to the natural tree for seed. So, in soil exhaustion, tree exhaustion, and in budding I maintain we have causes, not only for deterioration of stock, but for the production, possibly, of the yellows and other mysterious diseases, which have not yet been disproved, at all events, by the literature which has come under my notice.

In discussing soil exhaustion as a cause, Professor Smith attributes to both Dr. Goessmann and Professor Penhallow error of logic in concluding from analysis, that a deficiency of potash was the cause, and asks: "May this deficiency not have been an effect of the disease rather than a cause," and proceeds to argue that a sufficient number of analyses

have not been made to warrant the conclusions of Dr. Goessmann, and that from present information "it is not known that trees stunted by borers, or by root aphides, or by starvation, would not yield chemical results identical with those given by trees suffering from yellows."

T. V. Munson, of Denison, Tex., in a letter to me, advises liberal use of potash fertilizers as a preventive, which would seem to imply that he agrees with Dr. Goessmann. Professor Smith gives, as illustrating his position, the treatment given several orchards in which kainit, potash, and other fertilizers were used two, three, or four years, but he does not show that the amount used was sufficient to restore and maintain the proper proportion of potash to the soil. In animal life we know that if the progress of a disease can be arrested, or has run its course and the patient has sufficient vitality remaining, he will recover. May the same not be true in vegetable life? If it be, is it not logical to conclude that if the soil be restored to the normal condition necessary for its subsistence, that the tree also will recover and throw off the disease? This raises, also, the question of adaptation to climate as to natural conditions, which is not within the purview of this letter.

Recess till 2 o'clock P. M.

AFTERNOON SESSION.

Acting President Buck in the chair.

DESTRUCTION OF FORESTS AND REFORESTATION OF THE COUNTRY.

By JOHN H. FOWLER, of Santa Rosa.

The last census, showing the rapidity with which the pine forests of the Northwestern States are being exhausted, has given renewed interest to the subject of forestry. When we reflect that a generation ago the forests of Michigan, Wisconsin, and Minnesota were regarded as inexhaustible, and then contemplate the immense drafts that have been made upon them during the period named, to build up such great cities as Chicago, St. Louis, Detroit, St. Paul, and the countless other cities and towns, together with the vast network of railroads that cover the territory supplied from those forests, it is not surprising that such inroads have been made, or that people who have given thought and study to the subject should discover that the end is near, and that it is high time that the people of this nation should earnestly consider the subject of forestry.

The fact that our population is rapidly increasing and the demands upon our forests increasing in like ratio, forces upon us the inquiry, How long can we continue to pursue our present wasteful methods of cutting, burning, leaving to decay, so much of our timber and make no provision for the restoration of the forests, without great injury to the future welfare of the nation and justly incurring the censure of those who shall occupy this land but a few generations hence? They will surely reproach us for our want of foresight if we, who inherit

a land rich in the variety and abundance of its forest supplies, with vandal hands destroy this rich inheritance and leave only to them bare mountains, barren slopes, and sandy plains, where our vast wooded tracts once stood in verdant beauty and priceless value. If it be true, as the census of 1890 shows, that there only remains in private hands in the three great lumbering States of the Northwest a supply of pine timber for five years more, reckoning at the present rate of consumption, does it not argue, with unanswerable logic, that the State and Federal Governments should at once take measures to secure what they control from hasty and unprofitable destruction? Lumbermen throughout the country, and particularly in California and on the Pacific Coast, complain of the low price of lumber and the want of markets for the milling capacity of the country. In consequence, we have lumber forced upon the markets in great quantities, at the bare cost of manufacture, and no value returned for stumpage. This has been a fact for a large part of the period in which the business has been conducted in this State. Some few firms favorably located for shipping, and either getting standing timber from government land without paying for it, or getting it at a merely nominal price, have considered only the cost of manufacture. This has forced competition to adopt like methods and accept similar prices; hence, only the choicest trees were cut and only the best logs out of them taken, while the torch has been ruthlessly applied to the destruction of the remaining portions. The aim has been to secure choice logs with the least possible labor and expense, and with but little regard to the value of the standing timber. When timber could be taken from government lands, without risk and without compensation, that would yield from one hundred thousand to five hundred thousand feet of sawed lumber per acre, or purchased at a price per acre less than the price of a day's wages for a teamster or chopper—that is to say, for \$2 50 per acre—there was very little encouragement, in the face of sharp competition, to be saving of the timber.

This State has sold much of its timber land at one half the price obtained by the Federal Government. Hence it appears that, while we have a Forestry Division in one of the departments of the General Government, which, in the language of the Chief of that division, is said to "have been conceived for the purpose of specially interesting itself in the proper development and maintenance of one of her choicest natural resources" (the once so-called "inexhaustible" forest wealth), and a State Board of Forestry, presumably created to do similar work for the State, yet the State and nation may be said to aid and abet in this wanton waste by virtue of the want of more effective work in preventing timber stealing and the nominal price put upon its timber lands by the nation, and the practical giving away of its choicest timber lands by the State, since the price received for such lands amounts to almost nothing in comparison with their real value.

That which costs nothing is very apt to be regarded as worth nothing. The lumbermen reasoned, We got the timber for little or nothing, consequently it is not stumpage that cuts much of a figure in our operations; but how shall we make the most high-grade and high-priced lumber at the least cost of manufacture? The answer to the question seems to have been: saw clear logs as far as possible and burn the rest, since it costs no more to saw and ship a thousand feet of clear lumber worth \$30, than to saw and handle a thousand feet worth only half as

much. The low price of lumber in the market may have, and probably has, encouraged wastefulness on the part of the consumer, and thus there has been loss at both ends.

The great Burke said: "Every new advance of the price to the consumer is a new incentive to him to retrench the quality" (and I may add the quantity) "of his consumption."

The millman gets his timber cheap and, per consequence, the consumer gets his lumber cheap, and both are wasteful, the former, however, much more than the latter. What can the State and nation do to remedy this? The answer plainly is: *First withdraw all State and Federal timber lands from sale.* This will withdraw from competition with lands in private hands that which tends to depress the value of all other timber lands as long as they are offered at the low government valuation, and by enhancing the value of timber lands and stumpage would necessitate more economical methods on the part of saw-mill men, besides preserving for future use a part of this wealth which is now being squandered.

If to this reasoning some should object on the score that it favored legislation which would enhance the cost of lumber to present consumers in the interests of our successors, it must be answered that governments are formed and this nation exists not for one or two generations alone, and that it is the work of Legislatures to protect the State from the avarice and wanton aggressions of the individual members of the body politic. The statesman who will be honored by posterity will be him who exercises a wise forethought for future interests and the permanent welfare of the people.

The forests may be regarded as a trust. The lands in the ownership of the State and nation have been bestowed with lavish hands upon the people, until the period has arrived when it becomes necessary to stop and consider the consequences to follow if this course is continued.

If it is true that nations are like individuals, it is just as unwise and impolitic for this Government to squander its forest wealth, in the face of the facts of rapidly increasing population and certain future requirements, as it would be for a man having a large family of dependent sons and daughters, and owning broad and fertile acres, overflowing granaries and a long bank account, to spend it all in riotous living and leave his heirs in poverty, on the plea that poorhouses and charitable institutions were provided for the needy; and the legislator who refuses to raise his voice in behalf of the conservation of the riches stored in our forests, when convinced of its truth and necessity, is just as reprehensible as would be the individual acting in the manner described.

It is natural for man to desire to increase his possessions, and if he can do so more rapidly by wasting what he cannot profitably use, he will most likely do so. The desire to accumulate wealth in honest and honorable ways is healthful and commendable, and should be encouraged; but the honest and patriotic citizen intrusted with the responsible duty of guarding the interests of the State is in honor bound to see that the interests of the commonwealth do not suffer at his hands.

In this State nothing calls for more earnest consideration by those who make and administer our laws than the investigation of the question under contemplation; and the more the masses reflect upon and study this subject the more earnestly will they demand legislation of

this character. It must be done quickly, too, or it will be forever too late, as an Act withdrawing lands from sale after they are all sold will simply be locking the stable door after the horse is stolen. The State has an enduring interest in her forest areas, which in various ways affects her agricultural, climatic, and material prosperity, whereas individuals have only a life interest. Which shall the people make paramount? We are not only called upon to act in regard to lands already heavily timbered, but questions of afforestation and reforestation are both important in California. It includes within its bounds extensive mountain ranges, broad fertile valleys, and vast arid plains. The tree growth of the Sierras differs from that of the Coast Range, and the valleys and plains are, for the most part, treeless. Each district presents a different problem for consideration. In the Sierras we must guard against forest fires, and prevent sheep-herding on public lands—the former destroying both old and young growth, and the latter devouring every green sprout whereby the forests might eventually be restored. On the plains afforestation can only be accomplished through the aid of the nursery, proper preparation of the soil, and irrigation. If not all of these agencies are required at all points, some of them, at least, must be employed. In the redwood belt reforestation can be easily and successfully accomplished from seed and stump. Writing from the redwood district, I shall speak only of the latter method.

The northern boundary of the State is the forty-second parallel of north latitude, and this coincides almost exactly with the northern limit of the redwood belt. It is a fact that all the redwood in the world is found in the State of California, and by far the greater portion of the redwood acreage lies in the counties of Sonoma, Mendocino, Humboldt, and Del Norte. While heavy bodies of redwood reach to a point within two or three miles of the Oregon line, the tree is rarely found on the north side of the line, and only a few small groves and scattering trees occur there. Hence, the redwood must be regarded as a special endowment by the Almighty to this, our more than favored State. What a boon it has been and is to us! Note the thousand purposes to which it has been applied in building up our commonwealth, and the gold it has brought to our coffers, and tell me, in view of all the facts, if our management of this endowment does not amount to sacrilege.

A very large per cent of the land upon which redwood grows is rough mountain land, wholly unfit for cultivation. Some of it consists of table or bench land bordering the ocean, and some level land along the streams. Between the two extremes are found no inconsiderable amount of gently rolling hills and easy slopes.

As the forests in this region are so dense, and usually so completely cover the whole country, both from economical and climatic standpoints, the country will be benefited by the clearing and cultivating of a portion of the land. Already the timber has been removed on nearly all the table land along the coast, and most of the land adjacent to the streams. Not a little of this land has been utilized for agricultural purposes. The redwood is a persistent grower, and the land is hard to clear. The roots spread in all directions, and penetrate the soil deeply, so that the practice of digging out the stumps is rarely resorted to. The usual method is to pile up around the stumps all the refuse obtainable and make as hot a fire as possible. As green stumps will not easily burn, and do not die or dry of themselves, it usually happens that the

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sprouts start up from the stumps in profusion the following year, and must be chopped off and allowed to dry, and the firing process repeated, perhaps three or four times, before the killing can be effectually accomplished. Owing to this habit of the tree to reproduce itself by suckers starting from the stump, a very thrifty growth of young trees can be obtained, with very little labor or care, in a very short time. Here no planting is necessary, and no fences required to protect them, since neither cattle nor sheep will feed upon them. They want no irrigation, and simply require to be let alone. Keep fire away as far as possible, and if it is desired to render aid to the young growth, about all that can be done is to chop out the surplus sprouts (selecting, of course, the weaker ones) during the earlier stages of growth, and as soon as the leaders attain sufficient size and strength they will absorb the life-giving power of the stump. In this way from four to ten young trees may be grown where one stood before. As the new growth is nourished by the wide-spreading roots formerly required to support the parent tree, it usually makes a very rapid growth, and in fifteen or twenty years from the time of starting will furnish timber suitable for piling, fencing, and various other useful purposes. It is reasonable to suppose, from a financial standpoint, that no better use can be made of much of the land now being cut over than to encourage this effort of nature to restore our redwoods. Where the lands are favorably located with regard to shipping facilities, the returns for the second crop could, in many instances, be made to exceed the profits of the first crop. This is predicated upon the presumption that in fifteen, twenty, or, at most, twenty-five years hence, our redwoods will be to California as are now the pine forests of the Northwestern States to them. There the pine tree will not reproduce itself, and it is a question of no small importance, in Michigan for instance, what can be done to restore value to the square miles of sandy, barren plains whence the timber has been taken.

In support of this statement, let me point to instances which have come under my own observation. Near the farm of B. F. Tilton, in Green Valley, Sonoma County, there stood in 1853 a clump of redwoods of moderate size. About that time they were felled. Around the stumps sprang up a beautiful growth of sprouts and suckers. These were left to grow at their own sweet will. From time to time poles have been taken from the clump as wanted, and at the present time, on that small area, not exceeding twenty-five square rods, stands a beautiful grove of a hundred or more tall, straight, symmetrical trees, measuring from twelve to eighteen inches in diameter at the butt, and from fifty to seventy-five feet high, forming a charming background to a cozy little cottage which has been erected near by, and affording delightful shade to man and beast when noonday suns oppress, and a perfect wind-break when the west winds blow. The trees are worth for piles \$1 a piece where they stand. What would an acre yield at this rate?

Mr. Tilton informs me that in 1856, when he came into possession of his farm, he cut down a redwood near where his barn now stands. Beside the tree was a small sprout, which he allowed to grow. It was then about four inches in diameter, and twenty feet high; to-day it is two feet in diameter, and its green plume waves in the air one hundred feet above.

Six years ago, Messrs. Guerne and Murphy cut the trees on a flat bordering on Russian River, near Guerneville. They decided to seed

the land between the stumps to grass, but refrained from piling the refuse against the stumps, in conformity with the usual practice, in order that the new growth from the stumps might have a chance to live; the inducement being to restore, in a measure, beauty to the grounds, which, before the cutting, had been very attractive as a place of resort for pleasure-seekers and picnics. The debris was piled and burned, and after the work was done a more desolate and unsightly place could hardly be conceived. Nothing but great blackened stumps and burned soil and ashes. The grass seed was sown, and the stumps left to the tender hands of Dame Nature. The winter rains washed away the ashes, and sprouted the grass seeds, which soon carpeted the intervening spaces. Over the burned and mutilated stumps the benign mother wove a mantle of green, and in two years their hideous wounds were hidden from sight. Mr. Guerne says that now much of the new growth has reached a height of from twenty to twenty-five feet, and is from six to eight inches in diameter. The grounds now have an attractive and park-like appearance. The change from six years ago seems almost magical.

Mr. Guerne further informs me that numerous sprouts are now growing over and around each stump. That as they grow older, from four to ten to each stump will survive and overtop the others, which will succumb to the shade and vigor of the leaders, and in a few years the strong growers will alone remain, and just such a production will appear as that in Green Valley, just described. Other and probably more remarkable examples might be cited, but these will suffice.

In regard to the possibilities of our soil in reference to reforestation by natural seeding, I will ask your indulgence while I note some facts which I have witnessed since I came to the State in 1854. In the summer of that year I frequently rode over the country and neighborhood where the town of Sebastopol now stands. At that time the land was occupied with scattering oaks and clumps of manzanita, with wide grassy openings between. A person could drive with horses and wagons wherever his inclination led him. Ten years later I rode through there with the late Dr. T. M. Ames, a pioneer of 1846, and he remarked to me: "When I first knew this country it was all open land, and now see how it is growing up to fir. Why, a man on horseback can't get through it at all if he leaves the road." Yes, I replied, I have noticed that. Why is it, I asked, that these fir trees grow so abundantly now where they never grew before? He answered that formerly the territory was frequently burned over, but since the country had become thickly settled by Americans, they had kept the fires down, and the trees had quickly sprung into existence. Six years later Mr. Adam Crawford purchased the land where this conversation occurred, and cleared it off for a fruit orchard. This was in 1870, and he states that it averaged seventy-five cords of wood per acre, some of the heaviest yielding two hundred and fifty cords per acre. The land was set to fruit trees, and the orchard has been yielding fruit for sixteen years or more. Grassy, open land, thick forest growth, old bearing orchard, all on the same land, and all within the period of my personal knowledge, and the brief space of thirty-seven years.

Some of these lands where the trees have been allowed to stand to this date will yield three or four hundred cords of wood per acre.

What further proof can we ask as to the capability of our soil for

natural reforestation? Given a warm, sandy soil, a coating of grass, keep down your fires, and presto! you have a fir forest.

Would it not be well for the State to foster this natural reforestation? Comparatively few individuals feel willing to wait from fifteen to twenty-five years for a crop to mature, even though it be shown that lands worth from \$2 50 to \$5 per acre may be made to yield a harvest in that time worth from \$150 to \$200 per acre, possibly more. Although I am fully convinced that such an investment would prove highly remunerative, and that no better legacy could be left to our sons (except it be original timber lands), yet it does not seem to have attracted, as yet, the attention it deserves.

The great State of New York, recognizing the necessity for action in this line, has, through her Legislature, made a liberal appropriation for the purpose of purchasing timbered lands and lands that have been cut over, and has withdrawn her timber lands from sale. California should follow her example. Let her purchase some of those denuded redwood lands and place them in charge of the Forestry Board, with the object of setting an example, and proving the practicability and profit of this method of restoring redwood forests. Let her exempt from taxation, for a reasonable period, such lands of this character as individuals, under proper rules, may desire to maintain for this purpose.

The Federal Government has withdrawn a few sections of land in Tulare upon which the sequoias grow. Will the State in like manner save to herself a body of great trees? Does any of our millionaires seek to live in grateful remembrance in the hearts of the people? Let him donate to the State as a perpetual trust one thousand acres of *Sequoia sempervirens*, and it will be in fact, as the name implies, a living monument.

The noble sequoia is rightly termed the "Monarch of the Forest." The white man, boasted champion of progress and civilization, comes to these shores with double-bitted ax, double circulars, and band saws. He invades the domain where they have reigned supreme for twice a thousand years, and the sturdy monarchs fall before the invading army like grass before the scythe. Verily, "With torch and ax we make a wild sport of their blazing thrones." Shall the glory of the redwood pass away with the nineteenth century? Is the ocean that now beats with ceaseless roar along these glory-crowned mountains chanting his funeral dirge?

Hush! hush! the Redwood's dying.
Hark! through old forest dim
The wailing winds are sighing
Their requiem over him.

PEACH YELLOWS—(*Resumed*).

EASTERN PEACH YELLOWS.

By B. M. LELONG.

The future of successful fruit growing in California depends upon preventing the various fruit tree diseases so prevalent throughout many of the Eastern States from being introduced into this State. Importing trees from the East, especially from States where the yellows has

appeared, is very dangerous, and every person interested in the future of fruit growing in this State ought to discourage the practice in every way. There is no certainty that nurserymen in the East do not run short of nursery stock and are supplied from other States to fill orders from this coast. Also, there is no guarantee that dealers do not buy cheap trees from suspected districts and forward them as coming from perfectly clean localities. To be safe no person should buy imported trees, unless they are known to have come from localities absolutely free from the yellows. The yellows is spreading throughout the East with great rapidity, and is most alarming, threatening the destruction of the peach industry everywhere. The disease now prevails from Massachusetts to Virginia, and westward to the Great Lakes and the Mississippi River. The peach-growing sections of Massachusetts, Connecticut, New York, New Jersey, Ohio, Delaware, Maryland, Virginia, Kentucky, Indiana, Illinois, Michigan, Arkansas, Pennsylvania, and northern Texas are suffering from its ravages, and so far nothing can stop its destructive course; it is a most singular and obscure disease everywhere.

I could point out the damage done by this destructive agent in all the districts where it has appeared, but believe it would only be time wasted. As illustrating, one example will apply, to a certain extent, to all the rest; I therefore will only mention New Castle County, Delaware. This county has always been considered the largest peach-growing region of the East, and in 1879 the acreage devoted to the culture of the peach in that county was estimated at eleven thousand six hundred acres, but since that time this area has been steadily on the decline, caused by the yellows. In 1888 no orchards of any consequence were found between Middletown and McDonough, which formerly was so thickly planted. Large districts, once almost entirely devoted to peach orchards, are now bare and do not contain a single tree. It was estimated that there were one million seven hundred and fifty thousand trees in New Castle County in 1875, and six hundred and thirty-two thousand four hundred and twenty-seven baskets of peaches were shipped that same year. New Castle and Middletown are no longer the center of the peach region, and the peaches now shipped from there are hardly taken into account. Speaking of Delaware City and Middletown, Dr. Smith says: "The 'glory and profit' of peach growing have departed, and under the same blighting influence." The damage caused by yellows extends to all the other counties in Delaware, and also in the States above mentioned in no less destructive form.

In June, 1890, I visited the principal peach-growing regions of the East, and especially those of Delaware, Maryland, and New Jersey. The great number of orchards that had been rooted out, on account of being infected by the yellows, was really appalling. Vacant fields could be seen everywhere (now principally devoted to cereals) that once were peach orchards.

Large orchards that once were very productive have been swept out of existence by the scourge. Thousands of acres have been taken out, and many more will be uprooted and burned. The scourge is also doing havoc in many sections where, previous to 1888, it was not known to exist. Such remnants of orchards are seen everywhere, and the stumps remain only as evidence of the destructive work of this scourge.

The newspapers of the East have recently announced that an English syndicate has secured an option for the purchasing of a number of the larger nurseries in western New York, and also that the project con-

templates the absorption of some of the best known nurseries of Rochester, Geneva, and Lockport, besides others, and to place on sale their trees wherever they can. It is a scheme to buy and sell, no matter from where or to whom.

That there is danger of introducing the disease on nursery trees cannot be doubted, from the fact that in the East it has been taken from one locality to another in this way, the trees developing the disease the same season after planting.

The first cases of yellows that have been found in new districts are generally, if not always, in young trees imported from infected localities. "Yellows is a disease of haste and waste; the fruit ripens too soon, the buds push too soon, assimilation is disturbed, the stored starch and other food materials are wasted by excessive and unnatural growth, and the entire vitality of the tree is exhausted in the course of two or three seasons."

This State is thus far free from the disease, and the introduction of all trees from the Eastern States should be prohibited by stringent legislative enactments and county ordinances.

From time to time we have warned fruit growers of the danger of introducing dangerous insect pests and diseases not known in this State, yet, strange as it may appear, and in the face of all these warnings, many persons are eager to buy trees grown outside of the State, principally on account of their cheapness. There are many large land owners and real estate speculators in the State interested only in the speculative value of their land. They do not care for the fruit industry, and will plant those trees which are cheapest, so as to have a large acreage of planted trees. These lands are sold at great profit, and dangerous pests and diseases are liable to be thus introduced on inferior and infected imported trees.

The yellows is a constitutional disease of the peach and nectarine, prevalent throughout many of the Eastern States where the peach is grown, and peculiar to America as far as known. It has also been observed on the almond and apricot.

"Within a few years after it was described, yellows appeared in all the Atlantic Coast States north of Virginia, and caused great loss, destroying in a few decades hundreds of orchards and thousands of trees in Delaware, New Jersey, Pennsylvania, New York, and Connecticut, and putting an entire stop to peach growing in many sections."*

Dr. Erwin F. Smith, the Special Agent of the Department of Agriculture, to whom the investigation of the yellows has been especially assigned for several years, in 1888 reported that the disease had extended from Maine to Georgia, and westward to Lake Michigan and the Mississippi River, and that in recent years it appeared in Michigan, Illinois, and Georgia, and has not disappeared from any of its former strongholds. "In recent years the disease has been no less destructive than formerly. Thousands of young and thrifty trees have been destroyed by it, and peach growing has been abandoned in several parts of the country, where formerly there were many large and profitable orchards; *e. g.*, at Saint Joseph, in Berrien County, Michigan; at Middletown, in New Castle County, Delaware; near Niagara River, in New York and Ontario, and along the bay shore in Hartford County, Maryland. The disease

* Report of Erwin F. Smith on the yellows, Bulletin No. 9, Division of Vegetable Pathology, Washington, 1888.

now prevails disastrously on the Chesapeake and Delaware Peninsula, in the most productive peach region of the continent. On this peninsula it is confined principally to the counties of Cecil and Kent, in Maryland, and of New Castle and Kent, in Delaware, but is extending into other regions formerly free. The disease is also now prevalent in Cumberland, Morris, and Hunterdon Counties, in New Jersey, and in other parts of the United States. It is everywhere the same obscure, destructive malady.”*

Thus far mycologists have failed to ascribe the cause of the yellows. It has, however, been attributed to various causes, such as severe freezing in winter, excessive rainfall, precipitation, parasites, etc.; but these causes have been carefully looked into and the yellows found thriving under all such conditions. All the combined efforts of the experts employed have not yet detected the cause of the malady, nor effected a cure in a single instance.

“It has been attributed to impoverishment of the soil, especially to a deficiency of lime, potash, and phosphoric acid; but it now occurs on fertile soil, both virgin and highly improved, in as destructive a form as was ever observed in the most impoverished district, and is now absent from certain poor sandy regions deficient in the elements necessary to the growth of vegetation.”

Of more recent accounts we have the following from the Delaware “Farm and Home” (a journal of unquestioned reliability), of October 22, 1891, viz.:

If there should yet exist any doubt of the fallacy of the theory that peach yellows is due to soil poverty, the work of Dr. Erwin F. Smith, this season, should now dissipate that doubt. This is the third season during which practical tests have been carried on in Delaware and Maryland, and with forty acres under experiment, the results all indicate that the disease spreads rapidly, and is as deadly among trees that stand in the best and most fertile soils as among those in the most barren fields. The theory was originally based upon some chemical analyses of diseased peach branches, in which there appeared to be less lime, potash, and phosphoric acid, and hence it was reasoned that the application of mineral manures to the soil would obviate the trouble. Some experiments made with sickly, neglected trees seemed to confirm this view; but when more carefully planned and comprehensive analyses and experiments were undertaken, the results show beyond cavil that no uniform proportions of these substances can be found in diseased twigs, nor in healthy ones, and that the mineral fertilizers exert no influence upon the disease to prevent or control it. The analyses made at the Connecticut Experiment Station in 1884 show diseased twigs that contained about the same amount of lime, less potash, but more phosphoric acid than healthy twigs. Those made by A. E. Knorr, in 1888, show twigs that contained less lime but much more potash than healthy ones. Other analyses made in 1890 showed similar results, and the conclusion reached by the chemists was that the proportion of these substances is dependent rather upon the degree of maturity of the twigs, than upon their healthy or diseased condition. The experiments made with fertilizers in the orchards of the peninsula show that the disease has spread as rapidly where heavy applications of potash and phosphoric acid have been made, as where the trees have been untreated.

I inquired, by letter, of the most competent authorities throughout the States where the yellows has existed, to know if it would be safe to import trees from districts in States where the yellows is known to exist, even if away from infested localities, and also as to the danger of introducing the yellows on pits or cions. I received replies showing that the disease has been introduced into the State of Connecticut and has made its appearance in Hartford, Toland, Middlesex, New Haven, and Fairfield Counties, on trees produced from pits taken from peaches from infested districts of Maryland, Delaware, and New Jersey.

*Since the above report was made the yellows has spread, and also has appeared in many new districts, as is shown in the accompanying map.

Authorities, however, dispute the fact of pits germinating which have been taken from fruit affected by yellows, as the fruit ripens prematurely, and therefore the kernel is undeveloped; yet those instances prove the contrary. As to cions, all agree as to it being unsafe to import them, as the disease can be inoculated. Others, competent to judge, say that its transmission by cions and buds has been very plainly demonstrated. The universal opinion is that there is great danger of introducing the disease on trees from States where the yellows has appeared, and that trees may appear healthy and yet be diseased, as the yellows seems to lie dormant in the tree for a considerable time before it shows itself.

MR. LELONG then explained the districts affected in the East, and the increase of the disease since 1888, by a large map.

DISCUSSION ON PEACH YELLOWS.

MR. MOTHERAL: Mr. President, in view of the paper that has been read, the County Boards of Horticultural Commissioners had a meeting last night looking to this matter, and they have some resolutions they would like to read governing the action that this Convention ought to take in view of the danger that has been so emphatically pointed out by Mr. Lelong.

[The resolutions were read, pledging the members not to buy Eastern trees, and warning others as to the danger, etc.]

MR. BLOCK: I move the adoption of these resolutions.

MR. MOTHERAL: This is the gravest question, gentlemen, that perhaps has ever confronted an assemblage of fruit growers. I live in a section of this State that I am proud of. We have rich soil, irrigated lands, and fine orchards and vineyards. But, sir, we realize that poverty is staring us in the face if there is nothing done to prevent the introduction of peach yellows into this State. We realize the fact that our wealth of soil will amount to nothing unless we have the coöperation of every section of the State of California to help us keep this dreaded thing out of the State. Our orchards, as Mr. Lelong has pointed out, will all be gone inside of five years, unless something is done. We must awake and adopt stringent measures. It is understood now by all the societies that this disease called the yellows is the result of low forms of life, like yellow fever, smallpox, and all those kindred diseases. There are ten thousand ways, so say our microscopists, in which they can be transported, and will sometimes evade the vision of the most thorough microscopist. We cannot be too careful. Pear blight is propagated in the same way; we brought it from the State of New York, and we have it now, as a fixture, perhaps, in a large part of Northern California. This is not so bad because it does not spread so rapidly, but we do not covet it here, and the only way to keep it out is to refrain from importation. Consumption may lie in the veins of a man and wife for their natural lives, and they may die, perhaps, of some other disease; but the germs will come back to their children. It is so with trees, and we must wake up to the importance of preventing the dissemination of this dreaded pest. We must not import any of these trees into the country. I think the Board of Supervisors of every

county can destroy this stuff after it comes here, and if this Convention will only give us its moral support we can go home to our several counties and go before the various Boards of Supervisors and present to them what has been done here in good, solid form. I believe we could get them to take certain steps necessary to support us. We must do it, or we will become bankrupt in a few years.

MR. JOHNSTON: The only objection I have to the adoption of the resolutions is that they do not go far enough. I indorse every word, and hope they will be adopted by this Convention, and I also hope that the movers of those resolutions will make them strong. We have men, good and true men, in California who are in the nursery business. We have a right to protect those men, and it is our privilege to do so, and I hope you will make those resolutions bind us not only not to buy such trees, but not to deal with men who bring them here. [Applause.] There are sufficient trees raised by good and honest, honorable nurserymen in California to supply all the necessities of this State, and if there were not enough this year they will raise more next. The only way to get rid of this dreaded pest is to cease importing the trees and patronizing men who will purchase them in the East.

MR. BUCK: I agree with Senator Johnston in full, and I know you cannot make this resolution too strong to satisfy me, and we have as representative an audience of fruit growers from this State, probably, as was ever in one hall before, and I believe that the sentiment that is voiced by this Convention will have its weight all over the State. I agree with Mr. Johnston, and I would not buy a tree of a nurseryman who I thought imported a peach tree from the East. You are never sure of a tree that you get from the East. I certainly, from this time on, will not buy a tree from a nurseryman who I know imports it from the East. There is danger in the air, and we are warned in time. Let us profit by that, and if you are short of trees you can raise them yourself if you cannot buy them; it is not a great deal of work, and it does not take a long time to do it, and you can raise them about as cheap as a nurseryman can if you will only go at it right.

MR. SAUNDERS: I think there can be but one opinion in shutting out the importation of trees from the East. The only question is how to accomplish it. You say this is a large representative body, and when you take into consideration the extent of the districts where peaches are grown, it is not so thoroughly representative. The time is now at hand when the peach trees are coming from the East, and we have no general law on the subject by which we can stop the importation of them, and unless we take more stringent measures than have been proposed here, there will be so many imported before we have this general law that our orchards will be completely ruined. The only feasible way, it seems to me, is to issue some publication from the State Board of Horticulture, and spread it broadcast over the State. Perhaps, if the Boards of Supervisors should undertake to bar it out, like the quarantine regulations, it would involve them in some proceeding in law. It might interfere with the interstate commerce law. Let us go to work and create a sentiment against importations from the East, by spreading this broadcast over the State, so that it will make it unprofitable for any one. It has been suggested that a good plan would be for the State Board to get out circulars of warning and danger, and put them into the hands of the

local societies that are interested in this matter, and let them then distribute them over their respective districts.

MR. BLOCK: I would like to ask Mr. Saunders how you can take any more effective means than by spreading it all over the State through this Convention, so that every man, woman, and child can obtain that knowledge which is so essential to their interests.

MR. COMPTON: This gentleman speaks about scattering the intelligence broadcast that the peach yellows is liable to be introduced. I think that is just what Secretary Lelong is doing. He has sent to all the Boards of County Horticultural Commissioners this news, and if they have done their duty they have scattered them broadcast throughout the different counties of the State. I am heartily in accord with the sentiments expressed here to-day, and I think Mr. Lelong has done his part, and if the people will do their part I think it will be thoroughly understood.

MR. WHITE: I wish it to be understood that these resolutions, as I understand them, do not cover the whole ground. At San Francisco we have the door through which all varieties of foreign scales are being introduced into our orchards, and which have cost this State so many dollars and so much anxiety and trouble. It is known that in the South Sea Islands, Tahiti, and other places, there are diseases that may be imported into California, and I think the resolutions ought to cover not only the fruit raised east of the Rocky Mountains, but I think should exclude the fruit coming in at the Golden Gate. Personally, I have seen peach growing in the Sandwich Islands, and it was very greatly changed from what it is here. I do know that they have the white scale there sweeping all through their beautiful groves, and turning them sere and yellow, constantly causing them anxiety. Now, our nurserymen can send down to the Sandwich Islands and import any amount of peaches—they have peach trees for sale—and if we confine our resolutions to the Eastern States they will go there. I think the resolutions should cover the whole ground. I am in happy accord with everything said about this, and feel that this Convention should throw forth its influence, and I believe it will be felt all over the State.

MR. JOHNSTON: I would state to Mr. White that instead of importing trees we have to export. Let us do one thing at a time.

MR. McGLINCY: We have no County Board that holds any meetings. Now, the question is, "How are we to get these circulars into the hands of individual orchardists?" I would like to ask if our county has been supplied.

MR. LELONG: I sent several thousand pamphlets to that county (Santa Clara); I sent some to various places there. The Farmers Union gave them to all that called, and I mailed a great many.

MR. McGLINCY: What I want to get at is the best way to get this matter before the orchardists of California, so they can know the danger of buying nursery stock. I have received within the last few weeks two catalogues and two especially prepared postal cards. I regret that I have not those cards with me. I received a letter which contained statements that I dare not quote to you, but they are strongly emphatic, and state that it is utterly impossible to grow a tree successfully that is imported from the region where the yellows prevails. Now, then, what are we going to do? We may sit here and resolve till doomsday and

have no effect, unless we have some machinery whereby we can place this matter in the hands of every single orchardist.

MR. LELONG: I will state that we issued twelve zincograph maps, fourteen by sixteen inches in size, and we have given them very wide circulation. We have also loaned to many papers the cuts that show how Delaware and Maryland orchards now look after having been destroyed by the yellows.

MR. MOTHERAL: When I go home I will put these resolutions and what we did in this Convention in every paper in the county, and then I am going to urge upon the other counties to appoint Horticultural Commissioners to take charge of this matter, and if those Commissioners who are here will go home and write this matter up for their papers, and see that it is published in every paper in the county, it will do a great deal of good.

MR. CLAFLIN: I think that we should resolve to pledge ourselves that we will not buy any such diseased trees, and that we pledge ourselves to discourage in every way possible the importation of those Eastern trees, and also that we will not patronize men who are engaged in importing those trees from the East.

MR. ROBINSON: It is an easy matter to have this knowledge disseminated. There is not one paper in San Joaquin but will publish anything that will be of interest to the fruit industry.

THE RESOLUTIONS AS AMENDED.

The resolutions having been amended to cover the objections made, were read once more, as follows:

Resolved, That it is the sense of this Convention that our fruit industry is in imminent danger from the introduction of a disease known as "The Yellows," and infesting many of the fruit-growing sections of the East.

Resolved, That in view of all known facts regarding the disease, it is of vital importance to the fruit interests of this State that no trees grafted or budded upon peach stocks grown outside of the State of California, nor any buds, cions, cuttings, or pits from such trees, be imported into this State from Eastern States, even though such trees are apparently free from disease.

Resolved, That we pledge ourselves not to buy any such trees, buds, etc., and that we will discourage, in every proper way, their importation, and also that we will not deal with those who, from this time on, are known to import such trees from the East.

Resolved. That we believe that the Boards of Supervisors of the several counties of the State should use all the authority vested in them to exclude all Eastern stock grown on peach roots, or, if introduced, to use all lawful means to have them immediately destroyed.

MR. BUCK: As there seems to be a very unanimous feeling, I will put the question.

Adopted without a dissenting vote.

REPORT OF COMMITTEE.

MR. AIKEN: Your committee appointed to consider and report action upon the annual address of the President, now make the following report:

To the Fruit Growers' State Convention:

Your committee appointed to consider and report action upon the annual address of the Vice-President of the State Board of Horticulture, and presiding officer of this Convention, make the following recommendations:

First—That the subject of the importation of trees from the East and foreign countries be referred to the legal advisory committee of the State Board of Horticulture, a standing committee heretofore appointed at a previous State Convention, with a request to

report to the State Board of Horticulture such legislative action as may be deemed advisable and necessary upon this and other subjects of interest to the horticulturists of this State, prior to the meeting of the next Legislature.

Second—That a special committee of three be appointed by the Chairman to prepare and present to this Convention a memorial to Congress to prohibit, by necessary legislation, the adulteration of food products in this country, and the importation of such products from foreign countries, and also a memorial to the honorable Secretary of Agriculture, to recommend the obtaining and dissemination of information as to the quantity and quality of products of the soil in foreign countries.

Third—That a standing committee of five, to be known as the Columbian World's Fair Committee, be appointed by the Chairman, with power to act as an advisory committee to the World's Fair State Commission, in matters relating to the exhibition of horticultural products of the State, and especially the adoption of a national scale for judging citrus fruits.

Fourth—That this Convention adopt a resolution in favor of the reissue of a condensed report of the proceedings of the State Board of Horticulture and State Fruit Growers' Conventions, from 1885 to the present time.

Your committee desire to commend the address of the presiding officer of this Convention as a clear and concise statement of subjects of interest to the fruit growers of the State.

R. B. BLOWERS,
W. H. AIKEN,
FRANK A. KIMBALL,
Committee.

MARYSVILLE, November 18, 1891.

MR. BLOCK: I move that the report be received and adopted.

MR. AIKEN: The resolution heretofore presented and adopted shows very clearly the moral support that legislation will receive upon this subject. The State Board of Horticulture and the several county committees will act promptly and ably under the authority now provided by law. But we all know that the laws of the State were not formed to meet exactly this case. Here is a proposition to prohibit the importation of trees into the State for certain reasons. The legal aspect of this subject should be referred to the legal advisory committee, made up of three lawyers of this State, to give this matter careful consideration and prepare a bill and submit it to the State Board of Horticulture, and present it to the Legislature of 1893. I think the moral support it will receive, through your efforts, in the Legislature, will result in the passing of a bill that will at once be effective, and will hereafter prohibit by law the importation of diseased trees into the State of California.

The report as read was adopted.

PEAR BLIGHT.

MR. MOTHERAL: I laid upon that table a live specimen from a pear tree, and if I am not grossly mistaken, that is a regular, orthodox Eastern blight. It was imported into this State from New York, and I will say to the gentlemen that I am as anxious to have that looked after as this other disease called the yellows. I think this Convention ought to take action upon it.

MR. CAMPTON: Mr. Motheral claims that this has been imported from the East. It may have been, but we have trees in our own county that never were imported from the East, that have the same disease.

MR. HUSSMANN: I beg to differ with the gentleman who spoke last. I have fought the pear blight all my life. I cannot recognize that as Eastern pear blight. The Eastern pear blight, wherever it strikes a tree, the limb or top of it dies and gets black; spots appear first, and then the bark bursts. Look at this limb and you will find it sound—no bark broken—and it has not the appearance of pear blight.

MR. GUILL: About four years ago the pear blight developed itself, according to the best information that we could get, in an orchard near Chico, and I understand the trees were imported from New York. They have been dying every year since.

MR. BUCK: It is time for adjournment, and I will state to you that to-morrow we will take up the question of transportation.

Adjourned.

TRANSACTIONS OF THE THIRD DAY.

THURSDAY, November 19, 1891.

Convention called to order at 9 o'clock A. M.
Acting President Buck in the chair.

HORTICULTURAL PROGRESS.

By J. L. MOSHER, of San José.

Horticulture has become a science, and no one may expect to succeed without a proper study of it. The enormous increase of horticulture the past eight or ten years is phenomenal. This enormous growth is not extensively known, nor fully appreciated. It has become the leading industry of the State, rivaling all others in the general distribution of its benefits. What other industry could have raised the value of our lands from \$10 and \$100 to \$300 and \$1,000 per acre? What other industry could have increased the population of our State so rapidly? Its enormous railroad traffic has made it one of the prime factors showing the need of California having a competing railroad and an isthmus canal.

When I say horticulture is not fully appreciated, I refer to the earnest and inexhaustible effort necessary to secure from our Legislature a proper appropriation, and to keep it from being cut down or abolished. Also, we do not receive proper encouragement and premiums at our State and County Fairs. A prize for an exhibit ranges from nothing to \$2 50 and \$5; and, perhaps, a gigantic display costing a large outlay of time and money, might receive \$25; while a common horse race would command a purse of from \$300 to \$1,000. Outside of a great name, of what benefit have fast horses been to California compared to horticulture? Only those who are interested in horticulture can realize the responsibility of bringing a tree into the world, and training it up as it should grow.

We have before us here horticulturists old in experience, who have come from all parts of the State at their own expense and time to give their knowledge and advice—knowledge that has only been acquired by many failures, and at a cost of time, labor, and expense. They will tell you how differently we grow an orchard to-day compared to the past. How careful we must be in selecting our trees from the nursery; how particular to choose the right kind of roots for certain kinds of soil; the kind of trees for different climates; how far apart and how deep to set, and how to cultivate and prune, and general culture of the tree; all of which is of very great value to the beginner, and if you don't believe it, you will find it out.

In pruning I have learned that it pays to cut back well all new growth and to thin thoroughly. You will not get as much fruit, but it is fine and large, pays better, requiring less labor in handling, commands a

good price, and the trees are more thrifty. Fruit should be as ripe as can well be handled. Fine fruit is never a drug, and buyers will come to you for it.

The curing of fruit is a great study. Look at the advancement we have made in each and every year, and yet we have much to learn. Who among us here would not say: "If I were to set my orchard out again I would do this or that differently?"

Now, a word about the office of the State Board of Horticulture. Five years ago we had one small room, with a pocket account-book, and the then small appropriation was not all used. To-day we have several large rooms, immense ledgers and account-books, and we have to be very economical with our present appropriation. The perfection of this office is the Secretary's hobby. Here several people toil early and late; hundreds of letters, specimens and samples of fruits and fruit pests, parts of diseased trees and leaves, and various other objects of inquiry are received daily, as well as many people calling in person, all seeking information. It is well our Secretary is a horticultural encyclopedia, and he is kept as busy as the President of the United States.

We have many dangers before us. There is the yellows, that terrible scourge. Insects and other pests are constantly being imported. But are we not able to cope with all of these? Have we not overcome the ravages of the cottony cushion and pernicious scales that once threatened us with destruction?

I invite inspection from our State officials and others to what this State Board of Horticulture has done and is doing, that they may see its necessity and value to the State.

DISCUSSION ON PRUNING.

MR. MOTHERAL: Mr. Mosher, in his very excellent paper, stated that he cut back thoroughly. I would like to know what classes of trees he meant. In the country where we are raising prunes we dare not cut at all.

MR. BUCK: According to the discussions, and what has been told here in Conventions repeatedly before, there is a wide difference both in locality and in kind of tree. In some sections heavy pruning and heavy cutting back are required, while in others it is done to the injury of the tree. I think we know as much about it now as we ever will, for you can only get the knowledge by making observations in your section as to the kind of fruit trees that you have. Will Mr. Mosher answer that question?

MR. MOSHER: My experience is that we do not cut our peaches and apricots back enough, for the limbs bear down too much in consequence of not pruning them judiciously.

MR. MOTHERAL: What time do you prune?

MR. MOSHER: All times.

MR. MOTHERAL: Did you ever prune after you took the fruit off?

MR. MOSHER: A great many times.

MR. MOTHERAL: What has been your success at it?

MR. MOSHER: A good many think they have found it successful; a number of my neighbors think that it is the best way to prune—just as

soon as they take the fruit off the trees. In fact, our prune trees are allowed to grow up, and then the weight of the fruit bends the limbs right over, but if they are kept back one or two years they would get all of the fruit from the center of the tree, instead of having it on the limbs.

DISPOSITION OF FRUITS.

By DAVID LUBIN, of Sacramento.

A profitable return to the producer for his product is a chief aid towards the general prosperity of the commonwealth.

While a profitable return may be desired and sometimes obtained, yet in the greater number of cases the results are unfortunately far from profitable, nor are the causes for unprofitableness always, nor even generally, to be attributed to the producer's fault, but the main drawback rather consists in faulty methods for the disposition of the product. Various attempts have been made to remedy the method, notably that in the adoption of the auction system; but notwithstanding the perceptible progress made, there is yet much to be done before the maximum results aimed at be attained.

Chief among the causes for the fluctuating results tending towards a minimum result to the producer is the hazardous character of the merchandise, which hazard increases in a geometrical ratio the farther the product originates from the consumer, thus inviting the cupidity for exorbitant profits on the part of commission merchants, dealers, and venders.

In the history of a given transaction in the sale of green fruits raised in California and consumed in an Eastern city, there are two radical phases in price, viz.: the minimum which the producer receives, and the maximum which the vender obtains; and the consumer pays the man in the middle, the commission merchant, however, generally coming out at the large end of the "horn" by reason of his ample profits, and this ample profit is what pinches the producer, and just as long as the commission merchant is to be the factor, just so long will he persist in big profits, and just so long will the producer remain entirely at the mercy of adverse circumstances beyond his control.

A radical change of method is to be sought for, a method that will remove the cause of adverse conditions, and at the same time be the means for the placing of the maximum price in the hands of the producer, and this method is none other than that the producer dispense with all middle men and sell his fruits direct to the consumer, and to the consumer only, in quantities down to a pound at a time, and this can be done; nor is it necessary that each producer do this personally, but through his own wage-receiving employés.

To illustrate, an organization is formed in Sacramento or Placer County among fruit growers, whose products are consumed, say in New York. They hire a manager and empower him to go to New York and employ, say fifty or one hundred venders at a fixed rate per day, conditioned that these men have some means for carrying a few boxes of fruit, and on leaving a deposit for its full value. These men, when found competent, could be dressed in white overalls and jumpers and a white cap, or in some other inexpensive but effective uniform, and the words, "Em-

ployed by the Placer County Fruit Growers of California," painted on the jumper front; each to be provided with an accurate scale, and a large sign reading: "Placer County fruit, direct from California, 15 cents per pound," and a notice that the vender is to give accurate weight, and complaints to be lodged with the manager, whose name, street, and number is given, and with the qualifications of strong lungs, plenty of muscle, and a knowledge of the streets in the district to which he is assigned, the man is ready.

With every pound of fruit he sells he can distribute Placer County or Sacramento County "literature," and in a short time these hired venders will become an "institution."

The commission merchant, of course, will not take kindly to this, but the man's muscle and his vender's license will be ample protection.

Many, no doubt, will hastily conclude that this method is proposed as a joke, but let those analyze the various factors touching the disposition of green fruits, and they will find that the ultimate factor in the present mode of disposition is the vender, and it is proposed herein to make him the only factor, and that in the form of an employé only. This method will give the producer the chief desideratum in the form of the maximum price, and he will be able then, and only then, to fix and receive his own price for his product, and receive it direct from the consumer. Not alone can this mode be adopted for the disposition of green fruits, but dried fruits and even vegetables can be sold thus; nor need this method for distribution be confined to the Eastern cities only, but it may be employed with dried fruits in such cities in Europe likely to demand them—notably among them London; and as to General Chipman's proposition before the State Board of Trade, that of establishing a permanent agency in London, no better test can be given that market than the one under consideration.

It may be said that the antagonism of the commission men or the venders who buy from auction would tend to lower the price beyond a profit, but such can only be the case when the product is sold at wholesale; but when sold at retail, direct to the consumer, no attention need be paid to any counter efforts other than to fix the retail price according to demand, considering the quantity on hand, and the time in which it is to be disposed of, and cost for wages of venders.

Grading and fixing prices can be done jointly by the Eastern manager and the Association Directors, using the telegraph for that purpose; and the lower grades can be offered at a lower price in the poorer districts of the city.

The chief factor for success in the adoption of this method is in the selection of a competent and trustworthy manager for the East, but it ought not to be an impossible task to find such a one whenever there is an earnest effort to do so. And in order that no loss may be sustained through the possible dishonesty of the manager, an arrangement could be entered into between the association and a reputable banking house whereby the shipments are consigned to the bank, and the bank appoint a clerk as receiver of all moneys direct from each vender; thereby the manager would not handle any money received at all.

Accurate accounts could be kept in a simple manner, rendering a daily report slip from each vender, properly countersigned and balanced, showing quantity sold and amount realized, and forwarded to

each shipper. In addition, a daily statement of balances could be sent to the Directors by the manager.

A much misunderstood and a much abused term is that commonly known as "market." Who and what is the market? Can any one tell? Analyze your experience and you will find that (as far as fruit products are concerned) a combination takes place among the commission men, and at once the "market" is depressed; or, an understanding among the venders at the auction-room, and the "market" is glutted, notwithstanding, however, the retail price may be 5 cents each for a three-ounce peach, or 15 cents per pound for grapes that were originally bought for 2 or 2½ cents per pound.

The "Rural Press" of November 14th, in a portion of an editorial headed "Coöperation in Fruit Handling," and which was intended as a recapitulation of the objective subjects for discussion at this Convention, makes the following statements:

"Whatever the kind of action required, the underlying principle is the same, and that is, protection of the fruit product from the combines or whims of traders, and from the accidents which beset trading by those who have only a merchant's interest in the product. Certainly it can be held to be demonstrated that the growers have it in themselves to inaugurate new and broad movements, and to lift their interest clear above the ruts when it is found that these ruts are cutting too deeply into the highway toward prosperity."

It would seem, therefore, that the method herein outlined comes within the scope of your consideration.

In conclusion, permit me to state that while the method proposed may seem new and experimental, yet when carefully looked into we will find no absolutely new phase of fruit disposition advocated here, excepting only the one feature that the vender be in the employ of the producer at fixed wages, and that the vender sell only at the price fixed by the producer to the consumer, and that he return all such proceeds to the producer or his manager.

As for the vender's ability in finding the consuming purchasers, that fact is here already and needs no elaboration, for who does not know that while green fruits originally are handled by commission men, yet ultimately, perhaps, 90 per cent of it is sold by the vender. By the present method in vogue both commission merchant and venders are speculators; by the method proposed the commission merchant would no longer be required, and the vender would be an employé.

Would not the expense and risk be great in this method?

Well, considering that the producer would be his own speculator, and that his returns would be the highest retail, in place of the lowest wholesale price, there is ample margin for all risks and expenses, and in addition the highest possible return, besides the vexations and oftentimes great loss to crop in the attempt to find a buyer or a market would be overcome.

Dried fruits sold in this way would find many ten thousand more purchasers than now, for the good housewife, who may not otherwise think of providing herself with dried fruit, on hearing the cry, "Fine dried California peaches, 8 cents a half pound," would be tempted to buy right there and then.

The poor and densely populated districts of a city, especially, would, by this method, become purchasers of our products to a much greater

extent than by any other. Nor need the producer confine himself to disposing of his green and dried fruits direct to the consumer, but canned fruits can be disposed of with equal advantage.

Whoever has attended assemblies like this Convention, or popular gatherings among producers, or has perused current agricultural journals, will remark the oft-recurring generalizations relative to the detrimental influences of the middle man in curtailing the legitimate return to the producer. Hopeful anticipations are indulged in, tending towards a desire to be rid of a factor deemed destructive. Indeed, practical attempts have been made in that direction with varying results, but, as a general rule, the attempts have proved failures, and the producer, who shortly before thought he had found a key to utopia in dispensing with the middle man, found out by costly experience that his utopia was a delusion, and returned sorrowfully to the old time method, and again the middle man became the ruler of his destiny.

So complete was the defeat that the cause was not even looked into with that degree of research as to identify and verify certain commercial laws, the knowledge of which would mark axiomatic progress; and as a result current notions prevail and are repeated parrot fashion by the interested thinking, and by the disheartened unthinking element, that "a man cannot be a producer and a merchant at the same time."

Well directed experiment, based upon a correct knowledge of commercial law, however, may in time indicate the unsoundness of that statement, at least as far as green and dried fruit production and distribution are concerned.

At the present stage of experience it would be safe to state that such products as grain, hops, or wool cannot be sold to the consumer direct, and a middle man, perforce, must step in at some stage before the bread, beer, or blanket reaches the consumer; but with dried and green fruits the case is quite different, and if it is at all possible in our time to dispense with the middle man, it is in a product that may go right from the field of the producer to the table of the consumer without any other transformation than cooking, and in the case of green fruits it is ready, awaiting only the means and appetite of the consumer.

Here there are no barriers other than conventional usage of trade, and while the prime experiments in this direction may not at the start bring about that measure of success that later and more matured experiences may, yet it is a step towards the desired wish for the highest possibility, which, even by its failure, would tend to bring truth nearer at command.

Assuming, then, that green and dried fruits could be disposed of by the producer direct to the consumer, would it be safe to attempt it on a large scale at the start?

Obviously no; for there are lessons to learn that must necessarily involve waste of energy and means in the learning, and it will be time enough to involve much when there will be a surer certainty of positive gain.

Any enterprising county organization can enter the field as a start, and even if they do not meet with complete success at first, they will more than make up for any loss by the advertising the novel character of their enterprise will bring them in the East.

Should success crown their efforts, however, then indeed will their experiment prove of value, not alone to themselves, but to the commonwealth.

DISCUSSION ON THE DISPOSITION OF FRUITS.

MR. MOTHERAL: It seems to me that that is the only solution of this great and important question, and we ought to try and adopt it in all of the counties of the State.

MR. WALTON: I would like to ask Mr. Lubin how he would protect the grower in the return of the money.

MR. LUBIN: I would like to state, Mr. Walton, it is the simplest proposition imaginable. It is in operation in almost every business house, and that is, you can consign to your attorney or to your bank, and have the clerk of the bank appointed receiver.

MR. HUSSMANN: I am heartily in sympathy with this movement, and, although I do not grow fruit, I can cite a little experience of my own in the disposition of wine, which is somewhat analogous. The wine product of the State has mostly been handled by a few San Francisco dealers, middle men, and commission men. Last spring we had a fine lot of wines, and the only offer we could get was 12½ cents per gallon in bulk, and the man who offered it to me told me he gave me 2½ cents more than anybody else. I got excited, and I thought to myself, is all my trouble and all my care that I have taken going for nothing, and my fine wines to do no better than those of anybody else? I had a thousand gallons, of which half was slush, and I started out on a trip and tried to dispose of it myself. I went over to Oregon and Washington, and spent three weeks, and although my sales were not very large, the same wine for which I was offered 12½ cents I got 40 cents. Those who saw my wine told me it was the best and cheapest that had been offered in the market, and they had to pay dealers more for an inferior wine than it cost them directly. Now, there is an instance of dealing directly with the consumer.

MR. MOTHERAL: I move that a committee of five be appointed by the President to proceed in the best way to put into execution the ideas embraced in the paper of Mr. Lubin.

Adopted.

COMMITTEE.

President Buck appointed on said committee, N. W. Motheral, of Hanford; P. W. Butler, of Penryn; D. Lubin, of Sacramento; John Markley, of Geyserville, and G. M. Gray, of Chico.

MARKETING CALIFORNIA'S FRUIT CROP.

By B. N. ROWLEY, of San Francisco.

All present will readily recognize in the subject selected for this essay one embracing so many vital points, that to carefully consider them in detail would occupy the time of the entire session to the exclusion of other important matters; I will, therefore, endeavor to be as brief and explicit as possible in developing the more important points for discussion.

For the sake of convenience, we will deal with the subject-matter under the following classifications:

First—Fruit for Eastern shipment.

Second—Fruit for canners' use.

Third—Fruit for drying.

Fourth—Fruit for local markets.

The growing of fruit for market can now be properly classed as a horticultural art, having long since outgrown the term business. In California we recognize the natural fruit orchard of the American continent, with climate and soil almost perfect. These favorable conditions have been taken advantage of by thousands of industrious, intelligent tillers of the soil, and to-day California stands comparatively ahead of all competitors as an all-around fruit-producing country. Each season witnesses the planting of thousands of acres to trees and vines. The quantity of fruit that can and will be produced within the borders of this great State within the next decade cannot be easily estimated by statisticians of the present day, and can only be approximately appreciated by those actively engaged in the nursery and fruit-shipping business. Fruit growers in the States east of the Rockies are fully alive to the competition from California's fruits, and are to-day industriously, energetically, and systematically working to meet it in the markets of the East and West, "fruit for fruit, and quality for quality."

We quote from an Eastern journal published in an extensive fruit-growing district: "It is an undisputable fact that large quantities of California fruits are annually disposed of in all the principal markets of the States east of the Rocky Mountains, and at much better prices than it is possible to obtain for the great majority of home-grown fruit. What can local growers do? Produce fine specimens by better cultivation and thinning, and put them on the market in more attractive form. Such a course will help Eastern fruit men to hold their own in a degree; but the fact must be recognized that any section of country with peculiar adaptation for any product can in time gain the ascendancy over all others. The remedy lies in the hands of growers, and if they desire to have their fruit recognized as equal to California fruit, they must make it so attractive in style and honest in quality that the buyer or consumer will not make invidious comparisons when it is placed by the side of California fruit."

These are broad but honest admissions made by leading dealers and handlers of fruit in large Eastern cities. The fruit growers of California occupy, from a fruit grower's standpoint, a most enviable position. Continue to cultivate your orchard in the future, as in the past—in a most thorough manner. Continue to thin, but more thoroughly in the future than in the past. The merchant's motto—"Goods well bought are half sold"—applies to the fruit trade. "Fruits well grown are half sold."

Use judgment in picking, and do not pull the fruit too green. Select only the largest, finest specimens, which should be wrapped and packed in bright, new packages of uniform size. Now, you are in a position to engage in a profitable fruit-shipping business. A profitable business is not of necessity a successful business. While it is a recognized fact that men engaged in trade endeavor to make a profit upon their wares, such profits should not be at the sacrifice of the future of the industry. Present profits are oft-times very much reduced, or even lost sight of altogether, for the purpose of securing the trade of certain localities.

TRANSPORTATION AND FREIGHT CHARGES.

This portion of the business brings fruit growers and shippers face to face with a problem hard to solve. As the matter stands at present, you are permitted to ship your fruit to the East. I say permitted, because carefully prepared statistics go to prove that growers and shippers are completely at the mercy of transportation companies. By hard knocks and experience, obtained at high cost, methods of shipping have been reduced to a science. At present, you have very little use for the expensive passenger train service, except for early, high-priced fruit, the refrigerator car on freight trains having largely superseded the special expedited service.

The saying, "It is the unexpected that happens," applies to freight rates on fresh fruits for the season of 1891. Growers and shippers naturally expected a reduction in freight rates in conformity with the size of the fruit crop and prices obtainable in the East; but, in the place of a reduction in a year of large crops, which means heavy shipments and low prices, the railway companies saw fit to increase the rate quite materially by making the rate to Denver, Kansas City, Omaha, and Missouri River points the same as to Chicago the year before, and, in addition, increased the minimum quantity for a carload in refrigerator cars from twenty thousand to twenty-four thousand pounds. This increase placed the freight rate at \$300 per car, to which add \$125 for refrigerator service, making the rate \$425 per car to Minneapolis and Chicago and all westerly points, including St. Louis and New Orleans; to New York, Buffalo, and Philadelphia, including refrigerator charges, \$535; to Boston, \$549 40 per carload, freight train service. Should passenger service or expedited trains be used the charge would be considerably increased.

We will take as a basis of calculation one thousand twenty-pound packages of fruit, allowing four pounds for the package, to load a refrigerator car of twenty-four thousand pounds, and five hundred forty-pound packages of fruit, allowing eight pounds for the package. By a little calculation we find that on the basis of Sacramento, allowing 1½ cents per pound as the cost of the fruit, each twenty-pound package must sell in Chicago and common points for 95 cents in order to net the shipper 2 cents per package, and each forty-pound package must sell for \$1 95 to net the shipper 3 cents per package; hence, it is that California fruit must sell in Chicago and common points at 5 cents per pound to cover expenses.

If California growers and shippers expect to realize a profit on their Eastern fruit shipments, expenses must be cut down considerably. The growers and shippers should have credit for conducting their business on as economical a basis as possible; hence, transportation seems to be the only point that can be attacked for a reduction of expenses. Year by year auction charges, commissions, and other expenses have been materially reduced; but freight rates are increasing in place of decreasing, as they naturally should with the growth of the industry. Shippers are well acquainted with the history of the wretched service rendered last season by roads east of Ogden, the losses caused by delayed shipments, and the claims that were presented to the transportation companies, many of which have been allowed.

Had it not been for the failure of the Eastern crop and the fancy

prices obtained for California fruits, shippers during the season of 1890 would have met a "Waterloo" from which they never would have recovered. This year, with an abundant fruit crop East and a large crop in California and low prices prevailing, shippers have sustained serious losses, which, under present conditions, they can only expect to recoup in an off year with high prices.

The overland shipments of fresh fruit from California for the season of 1890 amounted to 3,732 carloads of ten tons each; for the season of 1891, to November 14th, 3,804 carloads of ten tons each.

For the purpose of comparing shippers' net returns with the amount paid the railroad companies, I have secured, through the kindness of Mr. L. W. Buck, Manager of the California Fruit Union, the footings of numerous account sales, taken at random from this year's business, with the following results: Gross sales, \$209,663 20; freight, \$109,191 90; net returns to shippers, \$88,743 40.

By this showing, which is considered by Manager Buck a fair average of this year's business, you will notice that the transportation companies received, in freights, more than one half of the gross sales and the round sum of \$20,450 in excess of what the shippers received.

FRUIT FOR CANNERS' USE.

The fruit canneries of California furnish a natural home market for enormous quantities of fresh fruit. For canning purposes sound, ripe fruit of uniform size is demanded. If permitted to select this class of fruit, canners can afford to pay better prices than for an entire orchard. Cannery sales are more profitable at the same price per pound than sales for Eastern shipments. Fruit allowed to remain on the trees a reasonable length of time after turning in color increases materially in size and weight. Canners require ripe fruit, while for Eastern shipment, fruit a trifle green stands the journey best. Selling fruit to canners is simply one of the many business transactions that fruit growers engage in. From the nature of things each party endeavors to drive as shrewd a bargain as possible, the producer on the one hand and the manufacturer on the other. Your interests are in a great measure identical, the one dependent upon the other. The fruit grower, however, is the more independent factor of the two. He has open to him several avenues through which he can market his crop, while without the fruit grower the canner would be out of business.

The annual pack of canned fruits in California amounts to about 1,200,000 cases of two dozen cans each. For this are required 54,000,000 pounds, or 2,700 carloads, of fresh fruit. Allowing the average price to be 1½ cents per pound, our fruit growers derive the very handsome revenue of \$810,000 annually from this source. The canneries furnish a spot cash market, for which fancy packing and packages are not required. A very small proportion of the gross receipts have to be paid to transportation companies; hence, the sale of fresh fruit to our canneries should be reasonably profitable. Individual growers have their business differences with canners, furnishing just grounds for complaint. It could not well be otherwise, owing to the nature and number of the transactions, and the large amount of money and fruit involved. Do not be too exacting and restrict your markets; you need more outlets and a much wider distribution for the increasing products of your orchards.

FRUIT FOR DRYING.

Fruit drying is now one of our recognized industries. That judgment, experience, and money are required in this branch of the fruit business in California goes without saying. The dried fruit markets of the United States furnish the greatest and most available outlet for the vast output of dried fruit, which is increasing in volume year by year.

The markets of the South Pacific Islands and Australia have been partially developed and are taking fair quantities of dried fruit this season. Our dried fruits are also being gradually introduced into the various large cities of Europe, several trial shipments, consisting of carloads of choice apricots and peaches, having been distributed in the Old World at good prices. A very large, profitable trade will certainly result from the proper introduction of California dried fruits into England. The output of dried fruit in this State from the crop of 1890 was 48,700,000 pounds, or 2,435 carloads, classified as follows:

Apples.....	1,000,000 pounds.	Prunes	14,000,000 pounds.
Apricots	8,500,000 pounds.	Grapes.....	10,500,000 pounds.
Peaches	12,250,000 pounds.	Nectarines.....	500,000 pounds.
Pears	600,000 pounds.	Figs	350,000 pounds.
Plums	1,000,000 pounds.		

On a basis of six and one half pounds (which is a liberal allowance) of fresh fruit to one of dried, exclusive of prunes and grapes, which require three and four pounds, respectively, we find that the quantity of fresh fruit used amounted to 241,300,000 pounds, or 12,065 carloads. If that quantity of fruit had been shipped East in the fresh state, the transportation charges, say nothing of other expenses, would have amounted to \$5,127,625, as against \$730,500, the cost of shipping 2,435 carloads of dried fruit at \$300 per car, or 1½ cents per pound. This shows a saving to growers and shippers of \$4,397,125 on one item—dried fruit.

The fruit drier's best market should be at home for cash. The price for your dried product should be made in California, and not in the East. We are obliged to recognize certain Eastern and foreign competition, which must be met; but the basis of calculation should be established in California, where the goods are produced and manufactured. This can best be accomplished by concert of action on the part of large growers and driers in the various producing centers. What class of successful manufacturers do you find year after year placing their products upon the open market without a fixed value, permitting the purchasing public to dictate the price? The selling price of all manufactured articles should be based upon the cost or value of the raw material, added to the cost of manufacturing. The outlet furnished through the medium of the dried fruit market is a most valuable one, owing to the remoteness of California from the large markets of the country. The professional drier should be given some thought and encouragement. Growers must recognize the fact that the price of green fruit naturally regulates the output and price of the dried product. Low prices for green fruit induce a great number of professional driers to enter the field, who purchase large quantities of fruit for cash. The necessary expense of curing and preparing for market further adds to the already heavy outlay. Men engaged in this business require a large capital or good bank credit, and have but one object in view—that of making money. They are, as a rule, sharp and shrewd, and, while practicing economy in all branches

of the business, are alive to the fact that the best prepared and finest looking fruit brings the highest price. They are compelled to open the market by making a price for their dried product, based upon the cost of the raw material, curing and expected profit added. The market once opened and prices made, they have to be sustained, in order to avoid serious loss. In order to sustain the market, the professional driers and speculators call to their assistance the ablest of our commission men and brokers, all of whom are in close touch with the heavy trade in the East.

Frequently it occurs that the market sags and prices weaken. In place of rushing their fruit forward and pushing sales by cutting prices, they immediately withdraw temporarily from the market as sellers and become buyers. The natural result of such a movement is to strengthen the market and advance prices. The moment they succeed in disposing of a reasonable quantity of their dried product to Eastern dealers the pace is set and the traveling comparatively easy, as, by the last move, they have brought to their assistance the large distributors throughout the United States, who are equally interested with the manufacturers in making a profit on their purchases.

The high price demanded for green fruit at the opening of this season prohibited very many of our professional driers from entering the field; hence, this year's crop was largely cured by individual growers. There is a vast difference between what the trade terms a growers' market and a dealers' market. The fruit once sold and in the hands of dealers and speculators, the market becomes steady; quotations represent values which are obtainable, if not so high as to restrict consumption. When dealers have their money behind the market it is pretty sure to remain firm.

On the other hand, with the dried fruit in the hands of individual growers, scattered throughout the country, with each grower as well as locality making a different price, the market necessarily exhibits a state of weakness and uncertainty not inviting to cash buyers. Oft-times growers' necessities place them at a disadvantage, compelling them to part with their fruit at a most critical time, when they should hold in place of selling, in order to sustain the market. Free offerings on a weak market naturally cause prices to decline. In a measure these conditions account for the low prices on dried fruits this season.

FRUIT FOR LOCAL MARKETS.

The local market being the easiest of access, should be cultivated and extended. San Francisco, the largest natural local market of the State, should be one of the best markets for choice fruit in place of a dumping ground for the culls and refuse of the entire fruit crop. A very limited quantity of fine fruit reaches San Francisco, and visiting strangers are quick to notice this and other peculiar conditions of the home market. A city of three hundred and fifty thousand inhabitants, situated in the very center of a fruit-growing State like California, should certainly possess a fine public market and a large display of choice fruit. One of the greatest advertisements the State and her fruit industry could possibly have would be a well conducted public fruit market in San Francisco.

The retail price of fruit in San Francisco seldom, if ever, changes or

is affected in the least by the size of the crop or the price received by the growers. The retail price of fruit remains "three pounds of apricots for 25 cents."

Fruit, as a rule the cheapest article of food upon which the public can be fed, is notably conspicuous by its absence upon hotel tables. What member of this Convention has not noticed with supreme disgust the miserable quality of fruit generally placed before the guests? In Los Angeles and Riverside, the home of the orange, it is quite difficult to secure even an edible specimen from a hotel table.

At present, the fruit disposed of through the San Francisco market is handled by so-called commission merchants. With a few honorable exceptions, the handlers of fruit in San Francisco are a class of ignorant foreigners, a detriment to the trade and a libel on the honorable commission business. Fruit growers should devise some means whereby this class would be obliged to step down and out and rustle around for trade, in place of sitting upon a pile of boxes at their door waiting for some poor, unfortunate "Dago" or Chinaman to drop in and buy a box of fruit. It might be barely possible that a properly conducted fruit auction in San Francisco would, in part at least, remedy the existing evils.

DISCUSSION ON MARKETING CALIFORNIA FRUIT.

MR. BLOCK: This is to us a very important document, and will require much time to discuss it. Take those shipments: out of \$209,000 received gross, the railroad company got \$109,000, and the producer got out of \$209,000 gross, \$88,000. I have no doubt my friend has given a correct statement as far as he got it from the books, but it shows a great discrepancy, and yet it does not show it all. Out of \$88,000 that the producer got, a very large proportion had been paid out for boxes, paper, packing, and loading, and other incidental expenses. I do not think that Mr. Rowley has examined this matter so that he could give us the figures, but I venture to say that the amount realized is not over \$60,000. I think I am right, and I venture the assertion that he paid out \$8,000 for boxes and incidental expenses. Now, this is a serious matter to some of us growers. I suggest that a committee be appointed to whom this able paper may be referred, with the view of submitting some proposition to this Convention, if possible, to adopt ways and means by which that part of it can be remedied. It seems to me the railroad ought to make a reduction of one half of the gross sales. Two years ago I was at the California Fruit Convention; I urged the proposition that the railroad should carry the fruit at one half, but I was laughed at. I think the railroad should take it at one half instead of two thirds, as it is in the East. I have not digested this paper; it is a very important one. I move that this matter be so referred.

MR. ROWLEY: There is a matter in hand that this Convention will have an opportunity to remedy—the transportation evil—if it can be remedied; but whether it is the proper time now to present that matter, I am not posted.

MR. BUCK: Perhaps that will cover the same ground.

MR. BLOCK: If that is the case, I propose that the motion lay over.

MR. BUCK: The figures that Mr. Rowley has are simply taken here

and there out of quite a large number of statements of shippers. I think they are nearly correct.

MR. PORTER: In the matter of transportation and the ideas suggested, I have listened with great pleasure to the gentlemen who have preceded me, but I do not think that I have heard any ideas advanced that are adequate to the occasion of merchandising. I think there is one simple remedy for this matter, and that is, there is a railroad running across this continent that the people have furnished more than the cost. It goes from here at least to the Missouri River, or in that vicinity. We are informed that the owners of that road are laboring under a great disadvantage to make their money in it pay interest. It is rather a foggy proposition. They owe some bonds to the people of the United States, and they have allowed other bonds to precede the payment of them. I have, at earlier periods of my life, thought it would be a danger for a republican government to undertake to own its own modes of transportation, but since I have seen how successful we have been in some matters, to wit, the Post Office Department, and have read the late report of our able Postmaster-General, that no private corporation could conduct the business as cheaply as the Government, it has dispelled from my mind the idea which I once had, and I now believe it to be a wise and just proposition for the people of the United States to collect what is due them and discharge their own obligations, and take this little stretch of road that the people are laboring for so assiduously, and run it on the basis of cost. [Applause.] I do not see how you people are ever going to get away with these little troublesome questions. I do not see where we are going to stand in this business with little temporizing remedies. It is, in my opinion, a worthless outlay of time, and certainly humiliating in the last degree to go around and beg for something which rightfully belongs to you. [Applause.] I think a respectable body of this kind, and an interest of this magnitude, could certainly make its voice heard, if it were done in a proper manner, and that we go to work at this question and begin business on first principles, not the seventh, eighth, tenth, or fifteenth. The gentleman who preceded me took a brief diagnosis, or bird's-eye view, of the paper here, and as things stand, I move an amendment: "That when this matter is referred to this committee they take that fact into consideration with the other."

MR. BUCK: I do not understand the purport of your amendment.

MR. PORTER: I move that the question here under consideration be amended by adding that "when they take into consideration the question of transportation of the fruit of this coast, that they consider the question, the interest that you and I and all of us have in this matter, and consider it with the other, and see what steps, if any, can be reached in that way."

MR. BUCK: There cannot be an amendment until there is an original motion made. The original motion was made by Mr. Block and withdrawn for the time being; consequently, there is no motion in regard to that. Mr. Rowley stated that there was another matter that would probably come up here, and perhaps that would explain and afford some further information in regard to this, and so on the strength of that Mr. Block withdrew his motion.

MOTION.

MR. MOTHERAL: I desire to make a motion in relation to the paper read by Mr. Lubin. I move that this Convention appoint a committee of five to carry out the ideas embodied in that essay.

Carried.

RESOLUTION.

MR. MOTHERAL: I beg to offer a resolution sent here by the organization of County Commissioners, as follows:

Resolved, That it is the sense of this Convention that all pear trees grown in or outside of the State, in regions known to be afflicted with pear blight, be quarantined, and that no nursery stock shall be allowed to be shipped or sold from any district in the State where pear blight is known to exist.

MR. MOTHERAL, continuing: I move that the foregoing resolution be adopted.

Carried.

TRANSPORTATION OF FRUIT.

MR. MASLIN: I will detain this Convention but a few minutes; if I am out of order, the Chairman will call me to order. It is in reference to the transportation of fruit in this State, and a market for it. You have heard in this discussion some complaints about the extraordinary railroad charges for fruit transportation across the continent; but the people of the State of California have the remedy in their own hands by the means which Almighty God has provided, and that is the sea—the open sea—upon which there can be no monopoly. California is destined in time not to have one acre of land which will not be devoted to the raising of fruit. Thousands and thousands of acres will be devoted to dried fruits in the future, and, probably, the whole of the San Joaquin Valley. Now, we want a market for our dried fruits, and why we have not had it is something we have not been able to discover, except that all the people of the United States have had their tastes cultivated to green and fresh fruits. Look at that map from Maine across the northern line, excluding Montana, Idaho, and Wyoming, of which the people of all those States are capable of raising green fruits, while we have on the other side of the Atlantic fifty or sixty millions of people in England who are almost debarred from the use of green and dried fruits. There is a market for California in Continental Europe and in England. We have been corresponding with men there who have described the views of the people of England upon this very important subject, and a letter was received at the State Board of Trade yesterday from a gentleman who said that if he could place in England our dried fruits at the prices named to him, there would be a market in England for more than the State of California could produce. I am corresponding with a gentleman now at Hamburg, Germany, who left California about two months ago with the knowledge of the price at which dried fruits could be purchased here, and with a general knowledge of fruit quotations, and he tells me that California can find an offer for all of her dried fruits in Germany.

Now, it rests with us to solve this question. The State Board of Trade,

in its endeavor to open up this new channel of commerce to the people of California, and open a market to them for their dried fruits, have proposed to them—not with a desire to make any money—to form a corporation composed of the fruit growers of the State of California. We desire to raise a fund of about \$10,000 in shares, one thousand shares at \$10 a share, in which every fruit grower who wishes can take a share of stock, not for the purpose of making money, but for the purpose of raising a fund to enable us to send an agent to England who may dispose of our dried fruits, and to sell them at a very low rate in order to cultivate the taste of the people for it. These tastes have to be cultivated. You have to educate the people to these tastes, and teach them how to use and cook it, and hence the necessity for an agent. We are sending all over this State circulars to every fruit grower requesting him to take stock to raise this fund, and to try and relieve California of her dried fruits, and thereby get a market for this most valuable industry.

BLACK-KNOT.

MR. MOTHERAL: There is another resolution I would like to present, in relation to the black-knot:

Resolved, That a disease known as the black-knot, on nursery stock and vines, is being scattered over this State. That it should receive the attention of this Convention, and be brought to the attention of the fruit growers, and such measures adopted as will check the disease.

MR. WICKSON: In relation to the reading of this resolution, I will state, that as far as it is concerned, I am heartily in favor of it, but when you go beyond the reading of it you are getting into deep water. If there is any relation between the old black-knot of the plum and cherry of the East, and the black-knot which we find on the roots of nursery stock and grapevines, we do not know it. It has not yet been demonstrated. The cause of the old black-knot of the plum is well understood. This fungus can be readily made out, by one accustomed to such investigation, with the aid of a microscope. Microscopic examinations of the abnormal growth on the roots of fruit trees show that grapevines do not contain such organisms as are found in the black-knot plum. Now, when you come to see the so-called black-knot at the root of the peach and other trees, and of grapevines, you will find a different state of affairs existing. Several of us have proceeded upon the theoretical grounds that the cause of that abnormal growth was a small worm. Examinations have not borne out that assumption in all cases. I have, for a number of years, been examining those knots without success, or without finding that worm.

MR. BLOCK: I have received trees from different parties that were affected with black-knot, and upon investigation I believe the cause of it was wet.

MR. HUSSMANN: I have just a little personal experience to relate in relation to the black-knot of the grapevine. I have always looked for the cause of black-knot either in too close pruning of grapevines, bringing about stagnation of the sap, or early injury to the root before it has fully developed. In 1886, May 13th I think it was, when the black frost struck our vineyards and killed all the buds and shoots on the vines, it

was followed by black-knot. So my theory is that it is due to the other cause—the stagnation of the sap or bursting of the sap vessels.

The resolution was adopted.

TRANSPORTATION—(Resumed).

Resolution offered by S. J. Stabler:

WHEREAS, An organization has been formed under the designation of the Traffic Association of California, with headquarters in San Francisco; and whereas, the objects of the association shall be for the purpose of regulating traffic, that the interests and resources of our State may be developed by overcoming, through united effort, discrimination, inequality, and excessive carriage charges; also, to foster our commercial interests and industries by developing new territory for our trade and opening new fields for our merchants and producers to distribute their goods, products, and manufactures; also, to enhance the commercial prosperity of the State of California by encouraging the building of canals, improvement of watercourses and rivers, competitive systems of railroads, steamship lines, and for such further purposes as may tend to develop the interests of our State; therefore, be it

Resolved by this meeting of fruit growers in Convention assembled, That we do hereby indorse the aims and objects of the Traffic Association of California, as herein set forth; further

Resolved, That each delegate of this Convention hereby pledges himself to use his utmost endeavors in his respective locality for the establishment of a County Traffic Association; further

Resolved, That said local Traffic Associations be formed for the purpose of coöperation with the Traffic Association of California, and to participate in the great work to be undertaken by said association.

MR. STABLER: I have given this subject considerable thought. There was a gentleman on this floor yesterday who said he thought that the most important question for us to consider was the exclusion of peach yellows, and who gave as a reason, that the yellows attacked the fruit in this State just as it did in New York, and that we would suffer great loss from the disease. Now, I take issue with him in some things, and agree entirely with him in others. I think the next important question for us to consider is that of transportation. If we can keep out the yellows and raise good fruit, and then cannot get a market, there will be no use in raising it. The Fruit Growers' Conventions of this State, as you will recollect, and so do I, have been for a number of years appointing committees to investigate the proposition of a Traffic Association of this State. The Southern Pacific Railroad Company is the most despotic monopoly in this State. We know that the Chamber of Commerce and the Board of Trade, and, in fact, every organization in the State of California, have been bowing obsequiously to that company for a number of years. Now, Mr. Chairman, I have no apology to make to the Southern Pacific Railroad Company for criticising their action. I believe there is no gentleman in this Convention called upon to apologize. As an old Californian I recollect, and so does every old Californian here remember, that four men started in here with a nominal capital of \$175,000; that after the first shovelful of dirt had been pitched they appealed to the Government for means to build a road, and they received a grant of land from the Government, the proceeds of which have run up into the millions; they had no other capital, and never received any other but the proceeds of this land; and therefore I say that the Government built this road, with the exception of that nominal capital. That the law of Congress, at the time of that grant to them, provided that all of the lands of the United States were liable to preëmption and

sale to settlers of the United States at \$1 25; but when that concession was made to this road by Congress, in the same breath and in the same law they doubled the price on the even sections, and when they sold them to the settlers they had to pay \$2 50 an acre for it. Therefore, I say in equity the people of the State of California built the road, with the exception of that nominal capital. Our friend, Judge Davis, will tell you the same thing; therefore, I have no apology to offer to them, and I feel, as an old citizen of the State of California, that I have a right, in common with you all, to criticise them in any manner that I choose.

Now, Mr. Chairman, under this title of transportation, the only solution of this question, and the only redress that we can have, is by a competing line of railroad running from the Eastern States to the tide waters of this State; and if the time is ever ripe for it, it is ripe for it now. Of course we want the Panama Canal, but at the best that is ten or twenty years off, and our present orchards will have run through their maturity and died before that time comes. There are three or four lines of railroads anxious and willing and ready to run a branch of their lines directly to San Francisco. The Atchison, Topeka, and Santa Fe has been extended to California, and has been endeavoring to get up into Central California for years. When they got to Los Angeles the Southern Pacific ran a line to parallel them, so they could come no farther. That policy has been pursued throughout the entire State; every precaution has been taken, and every projected road, except the Donahue, has been either suppressed by competition or bought off or paralleled. The Rio Grande, from Salt Lake, is willing to come here. We know that in Southern California five or six years ago it was duller, and more quiet, and less progressive than in any other part of the State; but immediately upon the advent of the Atchison road, they commenced to progress, and they have progressed wonderfully and marvelously, and now have acquired more of a population than any other part of the State within the last five years, and are now most progressive and happy. With the advent of these roads we have built a city in a few years, and it is now on the high road to progress, and it is one of the saddest conditions of affairs to see our central section of California more and more oppressed all the time, it being the most productive section in the State. Heretofore there has been no unanimity on the part of the people of the State. I have been surprised and delighted at the progress made by this California Traffic Association, so called. I also noticed a day or two ago that it has taken such form and made such progress that our neighboring States have joined it. It seems that the little State of Nevada, not having one tenth nor one fifteenth part of our material wealth or prosperity, has donated \$1,038,000 for a competing railroad. Now, while we have been lying idle and apathetic, as we have, this single corporation has been going ahead until it seems it is going to be the hardest kind of a fight. The fact is, they are all united, and are almost as powerful as the State is, and unless the Convention and every member of it will come forward and join this California Traffic Association, or something else, we will get poorer and more enslaved than ever. We all know that this is a very wealthy corporation, and the first members of the Southern Pacific Railroad were worth upwards of \$200,000,000, and one of its original members has founded an institution of learning with an endowment of \$20,000,000, and one or two of the members leave wealth of \$70,000,000,

and some have \$50,000,000. In fact, we know that the wealth of the original members of the Southern Pacific is fully \$200,000,000, equal to two thirds of the assessable property of San Francisco, or one sixth of the assessable property of the State. The assessable property of this State last year was a little less than \$1,100,000,000, making this one company owner of one fifth or one sixth. As a gentleman has well said here this morning, they are above the law. They say to the Government: "You hold the second mortgage on the road, and we will pay you this money in sixty years, with 2 per cent, and if you don't like that, what are you going to do about it?" They go to the collector at Sacramento and say: "Here is a check for a certain sum of money; it is all we owe; we keep our books, and we estimate what we owe, and if you don't take that, what are you going to do about it?" These things have been done, and you know they have been done. When a Judge in the city of San Francisco exercises a little more nerve than is common in summoning railroad men to appear, they leave the State and decline to go, and then say: "What are you going to do about it?" and there is a case now in the Supreme Court of this State. Now, as I said before, I have no apology to make to this company. I say this is the right time, if I am correctly informed, for every producer and shipper here to respond unanimously to this California Traffic Association, and let us do something. As was said this morning, more than one half went to this corporation, and when you go to them they have two answers, and that is all I ever had from them, and I will guarantee that is all anybody had from them. The first is that "the roads do not pay at a less rate," and the second is that "they are tied up with transcontinental railroads;" and when they, from \$140,000 and the grant from this State, have accumulated \$200,000,000, I take the liberty of denying those propositions. I think it does pay. Of course, we cannot have access to their books. I hope that you will take action, and I hope every man here—every fruit grower—will see the importance of this, and see by their apathy that they have lost ground. Come forward and take some definite action. I suggest that there be a committee appointed by this Convention to represent the fruit growers in a body in the Convention of the Traffic Association, and means be provided for them.

MR. ROWLEY: The objects of the Traffic Association of California have been given to the people through the public press, not for the purpose of antagonizing or making any particular fight against any particular line; but there is an organization in existence known as the Transcontinental Association. It is composed of twenty-six roads, each having a representative delegate, and which, on a question where the rate of freight or the percentage of the traffic is concerned, requires a unanimous vote to raise or lower the rate. It is against the Transcontinental Association that the movement is directed, and not against the railroads themselves. Any local Traffic Association may send one delegate, the cost of his membership not to exceed \$150.

MR. BENSON: I see the old feeling is just coming up again. I am really getting tired of it. I am an old Californian, coming here in 1848, and am personally acquainted with the promulgators of that road and the men who built it. Now, what assurance have we, if we spend our money in getting a competing line into the State, that it will not get into the Transcontinental Association—that they will not join hands with the

Southern Pacific? We have none. How much cheaper do the people of Southern California get their oranges to the East than they did under the old regime? The only way to solve this question, my friends, is the governmental ownership of railroads. It is not right, my friends, to place in the hands of a few men such great temptations, and it is decidedly contrary to either a democratic or republican government. Australia controls her railroads, and you can travel for half a cent a mile first class, and they make good profit. Mark my words, they will not fight one another, but they will grind the producer under their heel and extract the last cent from him, as you do the oil from an olive; they are going to get all they can out of it, and will regulate your prices.

MR. KIMBALL: Peach yellows affects only one product, but transportation affects every product. It is within the memory of every person here when the first carload of green fruit was sent East for \$1,250, and the railroad company said it was a loss to them. I was a member of the California State Grange in 1878; I prepared a set of resolutions in favor of subsidizing the Texas Railroad with money, or bonds instead of money; when that resolution passed, two hundred and thirty-four voted for it out of a membership of two hundred and thirty-eight. Governor Stanford sent for me to come to Fourth and Townsend Streets; I went there and saw Mr. Crocker, as Mr. Stanford was away. He asked me why I was offering opposition to the Southern Pacific and Central Pacific. I told him I did not see why I should not. I paid my own money and was under no obligations to him or anybody else. He said: "You will never live to see a carload of green fruit taken across the continent at a less price than \$1,000; that it did not pay expenses." I said: "I hoped I should live to see that very thing changed, and that you will, before long, take four carloads of fruit for \$1,000, instead of one." He said "that that was entirely impossible," of course. I finally told him I would work to that end. He said: "Any railroad coming into this State, we propose to build it." I only weighed ninety-two pounds then, and I was sitting about ten feet from him with my hat in my hand, and I said: "Mr. Crocker, that depends—" "It depends upon what, sir," said Mr. Crocker. "Which is the smartest man, you or I." I was pretty saucy for a little fellow, but he made me very angry. I stated "that before long you will see a road in here of which you will not own one spike."

MR. CLAYTON: I believe there is an arrangement between the Atchison and Southern Pacific, whereby the former keeps out of the fertile valleys. All other roads are kept out by subsidy. Not long ago I was a member of a Convention assembled at San José. We were trying to get a competing line, and I had occasion to meet the Atchison officials last winter. They were very noncommittal, but the officials told me that the Southern Pacific agreed to give the Atchison anything if they would not build into the fertile valleys of the north. I certainly favor the resolutions.

MR. BUCK: I am decidedly in favor of this organization in San Francisco, but there is one thing about it that I am a little suspicious of. It has been started late. There are some names in there that I do not like, while there are others that I do.

Motion carried.

MR. STABLER: I move that a committee of three be appointed to consider this matter.

Adopted.

COMMITTEE.

THE PRESIDENT: I will appoint on that committee S. J. Stabler, B. F. Walton, and W. H. Aiken.

AFTERNOON SESSION.

Convention called to order at 1:30 o'clock P. M.
President BUCK in the chair.

APPOINTMENT OF COMMITTEES.

The President announced the following appointments:

On Resolutions.—Henry A. Brainard, of San José; Frank A. Kimball, of National City; A. P. Crane, of San Lorenzo.

On World's Fair.—J. E. Cutter, of Riverside; J. R. Dobbins, of San Gabriel; S. J. Stabler, of Yuba City; J. A. Clayton, of San José; Geo. Hussmann, of Napa.

On Memorials to Congress.—W. H. Aiken, of Wrights; B. F. Walton, of Marysville; C. H. Allen, of San José.

On Exhibit.—E. W. Maslin, of San Francisco; R. B. Blowers, of Woodland; Leonard Coates, of Napa.

SMYRNA FIGS.

By G. C. ROEDING, of Fresno.

It is now about ten years that the fig industry has been vigorously prosecuted by the orchardists in this State, their universal aim being to produce a fruit which would compare favorably with, if not equal, the world-renowned Smyrna fig of commerce, known as such for more than two thousand years, and described by the early authors of the ancient Greek era: Scientists of a later date have often attempted to discover the secrets surrounding the production of this fruit, but thus far none have succeeded in unraveling and explaining its mysteries for practical use. It has always been a puzzle to me how, in this long lapse of time, Smyrna has managed to maintain a monopoly of the fig business, as undoubtedly Italy, Spain, Portugal, and the southern portion of France must have equal facilities in soil and climate for the production of figs, but none of these countries, though growing numerous kinds of fig fruit, for food and for table use, have ever succeeded in producing a dried fig that can compete with Smyrna; and any one inquiring for first class dried fruit along the Mediterranean coast is always directed to Asia Minor, as the only place where it can be obtained in its well-known perfection.

Among those who have taken a lively interest in this country in the fig business I may say that the Fancher Creek Nursery has done a considerable share by importing and planting numerous varieties of cuttings

from Smyrna and other places, and it is only during the last two years that any practical results have followed its exertions. With the introduction of the White Adriatic variety it was thought the problem had been solved, and while it cannot be denied that this kind produces one of the finest of table fruits, it must at the same time be admitted that when dried it does not come up to the standard of the imported fig from Smyrna, lacking in its most essential points, viz.: tenderness of skin and flavor. The early conviction of this truth induced the proprietor of the above nursery to send his foreman, W. C. West, in the year 1886, to Smyrna, for the purpose of investigating the fig business on the spot, and to obtain a variety of cuttings, and all possible information for the successful prosecution of the business in this State. Mr. West remained in Smyrna four months, and, after considerable difficulty, succeeded in securing several thousand of the Smyrna fig cuttings, as well as quite a number of the wild figs and a few of such varieties as are grown for home consumption, some being used in the green state and others dried. Mr. West's trip and experiences will probably be of interest, and the following is a copy of his letter of November 6, 1886:

I am having no end of trouble. I find I have been watched by the people here since first landing; the parties from whom I first engaged cuttings have refused to let me have any at any price and I do not know what to do. I went to the American Consul for assistance; he informed me that I could only obtain the cuttings through a foreign resident, as the Smyrna people were very much opposed to sending cuttings of any kind out of the country for fear of competition. Seeing the utter uselessness of trying to secure the cuttings directly, I took out a hunting license, and with a passport which I had used on a former trip, I, with Mr. Hall, a gentleman who had resided a number of years in Smyrna, started for the interior, and was successful in getting cuttings from Erbeli (this is the valley where the finest figs are grown). I did not appear in the transaction at all, but was shooting in the orchard where the cuttings were being gathered, and kept watch of the Turks all the time, to see that they were cut from the right trees. From the valley I shipped them by the Aidin Railroad to Smyrna as licorice roots, the company refusing to take them unless consigned in this manner. On the arrival at their destination the packages were placed in the warehouse of the English Steamship Company, and there packed with sawdust in boxes lined with thick paper, and shipped on a steamer bound for London. With the assistance of Mr. Van Lennip I secured the wild fig cuttings, and also quite a number of other varieties.

After West's departure the following appeared in the "Oriental Advertiser," published in Constantinople, of December 18, 1886, from their Smyrna correspondent:

We often hear people exclaim "I don't care a fig," as if they considered a fig a very small matter. Our American cousins, however, look at it from a different, that is to say, from a commercial point of view. We always thought the fig growers of Asia Minor were jealous of any foreign competition, and we gave them credit for a certain amount of foresight and worldly wisdom; but we find that it requires but little of the gold dust of the New World to blind them to their own interests. The Americans have just succeeded in playing upon the dozing Smyrnaites a trick which will no doubt prove of serious consequence. Some three months ago Mr. W. C. West, of the Fancher Creek Nursery, Fresno, came to Smyrna to make a study of the Smyrna fig, and also secure cuttings of that variety for propagation in California. Fortunately for his object Mr. West on his arrival made the acquaintance of an Englishman, a resident of over twenty years, without whose assistance he would scarcely have succeeded.

This resident, by his energy and determination, brought the affair to a successful termination. Besides the figs, he took cuttings of other plants. This little incident serves to show that the Smyrnaites ought not to be so indifferent to such important matters. By this time Mr. West is on his way home with his cuttings, and, for the sake of the Smyrna trade, it is to be hoped that the fig will not take in California, though the chance is very slight. If it does, however, America will supply the European market with better "Elemé" than Smyrna ever produced. Another matter which should not be forgotten is that American machinery will, no doubt, take the place of manual labor in packing. The prospect of losing the fig trade is a sad one, and should provide food for reflection for all who live by its product in Asia Minor.

[We do not quite agree with our correspondent, for a Smyrna-grown fig, pomegranate, etc., will never be anything else, namely, the best in the world. Seeds and cuttings may

be taken to America or elsewhere, but a foreign soil will never be able to give the same nourishment and strength to the new produce so that no difference would be known between it and the old. At the same time our correspondent is, no doubt, right about the want of precaution on the part of those who run a great risk in jeopardizing the Smyrna fig trade.—Ed. "Oriental Advertiser."]

After a journey of seven months, the cuttings arrived in Fresno May 24th in good condition. Much to my surprise, most of them had sent out numerous roots into the sawdust, which was still in a moist condition, having no doubt absorbed moisture during the transit across the Atlantic. On account of the lateness of the season not more than about one third of the cuttings grew, the warm weather having already commenced, and were planted out in the orchard at the Fancher Creek Nursery the following year, where the trees are now growing vigorously in light, sandy, and well-drained soil. The Smyrna fig grows in what is known as the Aidin Valley, distant about seventy miles from the coast, and comprises the following districts: Erbeli, Nazli, Denizli, Balachich, and Aidin proper; but the choicest figs are produced in Erbeli, although the other districts grow a fig almost equally as good. There has been no regular system followed in planting fig orchards, each grower following his own fancy and ideas, the average distance being about thirty feet. In the orchards set out in recent years, however, the trees are planted fifty feet apart each way, and are trimmed four and one half to five feet high, so as to allow the cultivator to circulate under them without hinderance; the trees having been trimmed to their proper height, are never pruned unless the interior becomes too crowded with branches, in which case they are removed to admit a free circulation of air. The orchards are well cultivated, but are plowed shallow and are kept clean of weeds, the object being to have the ground in such a condition that the figs can be easily found when the fruit ripens and drops. The best figs are grown in the valleys, though the orchards sometimes extend up into the foothills for a short distance.

Heavy argillaceous soils are not suited to the fig, the soil (a sample taken from Erbeli, to which I beg to call your attention) resembling very much the sandy soils to be found in the San Joaquin Valley. The trees are irrigated during the first two years only, it being claimed that after that no water is necessary, as the fig succeeds just as well without, and to water the trees when in bearing would ruin the crop. Irrigation is practiced in the same primitive manner as it was a thousand years ago, water being carried to the trees in goat-skin sacks. The fruit, when ripe, is said to be of a greenish yellow color; the pulp seems to vary in different soils, in some being amber, others of a pinkish shade; although, when dried, this does not materially affect the fruit, as there is no difference in the flavor or external appearance. There are a great many varieties of figs grown in Smyrna, but there is only one kind which produces the dried fig of commerce. When the fig is ripe it drops to the ground (it is never pulled nor cut from the trees) of its own accord at the proper stage of ripeness; if gathered too soon it is worthless. Every morning and evening the figs that have dropped are gathered and are taken to the drying-ground, which is usually a space among the fig trees where some have failed to grow. A sort of hay, or more properly, a rush, which is indigenous in the Aidin Valley, is spread on the ground in rows about four feet wide, two inches deep, and a space is left between each row three feet in width for the convenience of the men handling

the fruit. The figs are laid on this bed of rushes so that they will not touch each other, no particular care being taken whether the eye is up or down, as the fig is about half dried when it drops from the tree. After the figs are spread out they are not touched until fully dried, which takes about five days. There is really no necessity for further handling, as the hot air circulates freely above and below the fig, and dries it equally on all sides. The figs, when dried, are collected in baskets and carried to a shed, where they are deposited in large heaps, then sorted in three grades. Nos. 1 and 2 are put in goat-skin sacks and taken by camels to the nearest shipping points. No. 3 consists of the worthless and split figs, and are used for distilling purposes. The Smyrna fig only bears one crop annually; that is, only one crop which matures fruit. The figs appear in the latter part of June, are fertilized in July, and mature their fruit from August 15th to October 1st. As to the growing of the wild, or *caprificus*, I shall make reference when I take up the subject of caprification.

GRADING AND PACKING.

Goat-skin sacks are used for the shipping of the dried figs, because the fiber from an ordinary sack would adhere to the figs, which are sticky and sugary, while goat-skin sacks leave them perfectly clean. The figs on arrival at the railroad depot in the city of Smyrna are loaded on camels and distributed to the different packing houses, or, if not consigned, are taken to the fig market to be disposed of at auction. The packing houses are all large establishments, employing from three to four hundred men and women, who are paid according to their expertness. The layer packers receive the highest wages—from 75 cents to \$1 25 per day; sorters, mostly women, are paid 20 cents a day. The figs when brought to the packing houses are emptied out of the sacks in large heaps, around which are seated women with stone jars near them filled with sea water. These women grade and supple the figs. The salt water is used to prevent the figs from sticking to the fingers, and also to assist in suppling. The grader takes up a fig, closes the hand over it, turns it once or twice, then pulls it until it is shaped like a bag. This handling of the fig leaves it very soft and pliable, and it is now again graded by pitching it into basket No. 1, 2, 3, or 4, according to its quality. These baskets are about twenty inches in diameter, with sides about four inches high, and when filled are taken to the packing-rooms, which are long and narrow, being from eighteen feet to twenty feet wide, with narrow benches about three feet from the wall on each side running the length of the room, with one row of packers on each side, leaving a vacant space in the center of the room for the convenience of the boys bringing in the figs and taking away the packed boxes.

On the bench within reach of each man are placed stone jars of sea water, in which are leaves of the laurel left there to moisten; the packer keeps his hands very wet by frequent dipping in the jars. The men packing No. 1 all sit together, likewise Nos. 2 and 3; the No. 4 is not packed, but is pressed in drums. When a basket of No. 1 is placed before a packer he grades the figs again by taking all the best figs out and passes those remaining to No. 2 packer, who again selects and passes to No. 3 those which do not suit him. The figs are put up in half-

pound and twenty-pound boxes. The packer takes a fig out of the basket before him, squeezes it flat, and by using his thumb and forefinger of each hand he brings the stem of the fig on the upper side, and the eye, or ostilum, underneath; he then pulls the fig as much as possible, squeezing it very thin; then again takes the fig in both hands, with the stem end turned down, the thumbs being pressed closely together on the opposite side, with the two forefingers placed firmly against the fig underneath. Still pressing the thumbs down he gradually draws them in opposite directions, and splits the fig by this process from the stem to the eye; then turning the stem towards him he straightens the fig out, making the sides nearly square, when it is ready to be placed in the box. This is the most difficult part of packing, the object being to have the bottom layer look as well as the top, should the box be opened from the bottom. I have examined large boxes of Smyrna figs, and have found without exception one layer packed just like the other.

The lines between the layers could not be straighter, even if they had been ruled; this mode of packing cannot be done, however, unless the fig has been split, thus permitting the drawing of the fig out until it is almost twice its original size. After the first layer is packed, the box is changed ends, the next layer being packed the other way, and so on until the box is filled. In the top layer, which is almost one fourth of an inch above the top of the box, four or five leaves of the bay laurel (*Lauris nobilis*) are placed. The boxes, without lids, are then taken by the boys and placed in stacks four to five feet high, and after a few days the weight of the boxes presses the figs down, so that the lid can be nailed on without any difficulty. No presses, no machinery of any kind are used; all the work is done by hand; this mode of packing is called "Elemé-pulled figs," Elemé meaning selected, and pulled meaning the pulling they go through in packing. The majority of the figs are packed this way, the trade demanding it, but by far the most sensible is the bag-shaped packing; the figs are not pulled, but are placed in boxes in square form, which is a much cleaner method of packing than the other. The residents of Smyrna have a very decided antipathy to the pulled figs, most likely on account of the filthiness of the lower classes of Turks, who do the packing. We would do well, in my opinion, to follow the example of the natives in purchasing the imported fig only when packed bag-shape, and thus encourage this mode of packing.

CAPRIFICATION.

This, the most important step necessary to produce the Smyrna fig, has been a subject more discussed than any other in connection with it. It has had but few advocates, most of our horticulturists being under the erroneous impression that it was a worn-out custom, which had been revived here with no other object in view than newspaper notoriety. That caprification is still practiced in Smyrna; that it has been a custom carried down from a time long before the Christian era and ever since the Smyrna fig has been an article of commerce, is an established fact, of which none who have read any of the old works on horticulture can express a doubt. It is a singular fact that, of all the varieties of figs I have growing at the nursery, the Smyrna are the only ones which require caprification to mature fruit, all the other varieties maturing their fruit without having the flowers fertilized; but still the latter, looking at it

from a scientific point of view, are not perfect, the seeds being all hollow, contain no germ, and if planted would not germinate. Nature is often mysterious in her workings, and it does seem strange indeed that this one variety should not mature fruit unless the seeds are fertilized. Experience, however, has taught the fig growers of Smyrna that unless they have the wild figs placed among their Smyrna figs the crop is a failure; and in years when the wild fig crop is scarce, caused by early frosts or other climatic conditions, the wild figs command a very high price, and are sold in the villages as merchandise. The caprifigs are not generally grown in the orchards, but in the hills, and where they are grown receive very little attention. One tree of the caprifig is considered sufficient to fecundate several hundred trees of the female fig.

The orchardists of Smyrna can give no clear explanation for the necessity of hanging the caprifig on the branches of the Smyrna, but they invariably assert that unless this method is strictly followed there will be no ripe fruit. The fig growers of Smyrna are evidently not a class of people who make it an object to investigate the wonderful workings of nature, but they accept the gifts of the Supreme Being as a right which they think Providence should have bestowed upon them. California horticulturists, however, they will find do not look upon a subject of such a vast importance with the same indifference, and I think I can safely predict the successful production of the Smyrna fig in such quantities in a few years hence (if brains and intelligence play any part in the success which has thus far followed the efforts of our leading horticulturists) that will make the editor of the "Oriental Advertiser" believe that after all his correspondent did not miss the mark very far when he prophesied "California would soon become a rival of Smyrna in the successful production and exportation of the genuine Smyrna fig." The caprifig and the Smyrna fig stand in the relation of male and female to each other, though it must be understood that the wild fig, being called the male, its flowers are not all male, nor are those of the other all female, for they contain both male and female, the former predominating in the second crop of the wild fig.

To properly understand caprification, and the manner in which the pollen is carried to the female fig, it will be necessary, first, to explain the construction of the caprificus. This fruit, known as a fig, though worthless as food, is really a hollow inflorescence, the greater part of the hypanthodium being lined with female flowers, which are mature when the eye of the young fig opens; while the male flowers, occupying a limited zone near the eye of the fig, mature later, when the fig is ripe. The caprifig ripens three crops annually, the first appearing in April, the second in June, and the third in August, the second and third crops beginning to flower when the previous one is ripe. The wild fig, as well as the cultivated, is monœcious, and also markedly protogynous (protogynous plants are those in which the stigma has lost its capacity for fertilization when the pollen matures, so that the fertilization must depend on the pollen from other sources). The propagation of the fig wasp takes place in the following manner: The female wasp forces its way, with the loss of its wings, into the fruit of the caprificus through the narrow ostolium, or eye, and lays eggs in the ovaries of the female flowers between the nucleus and the integument, placing one egg only in each, and then dies within the fig to which it has intrusted its offspring. In consequence of the puncture made by the female wasp, the female flowers in the fig enlarge after the manner of a gall, and in place of its

own embryo in the ovary the wasp embryo develops. Although the figs are protogynous, the wasp is protandrous (that is, the male matures before the female). The wingless male insects are the first to appear. They gnaw their way into the ovaries in which the female lie, impregnate them, and then perish within the fig in which they were born. The winged female then escapes by widening the passage made by the males, and either enters the following crop of the caprificus, when the same process as the above described takes place, or, if the fruit has been removed before and hung in the branches of the Smyrna tree, the wasp forces its way through the eye of the female fig, then in proper state of maturity to admit its entrance, and in its endeavor to lay eggs, and laden with pollen obtained in its outward passage from the caprifig, fertilizes the female flowers and perishes, leaving no offspring; as in the cultivated fig, the female flowers are so constructed that the wasp is prevented from laying its eggs in the proper place. The prevailing practice in Smyrna is to attach two caprifigs to each end of a rush, and from three to four are hung in each tree.

All the figs thus fertilized will mature good, edible fruit with solid seeds, while those escaping fertilization do not develop, and are worthless, and drop to the ground when about the size of a Damson plum.

My own experience with the Smyrna and caprifig generally confirms the above-mentioned reports, and differ only in some minor details, which may be ascribed to the fact that my trees are too young to produce fully developed fruit. One year ago the two varieties fruited, the wild figs ripening from June 15th to July 1st, and the Smyrna was then the size of a plum, the female flowers being at this time in proper state of maturity to receive the pollen. Not having the *Blastophaga*, I decided to try an experiment, although I felt extremely doubtful of success. I opened, however, quite a number of wild figs, shook the pollen into the palm of my hand, then rubbing a wooden toothpick in this pollen, introduced it into the orifice of the fig. Of the four figs fertilized every one matured, while all the other figs on the tree, when only half grown, dried, shriveled up, and dropped to the ground. After the fruits were dried I carefully examined them, and to my surprise found a large number of the seeds perfect; that is, had a seed germ. On tasting them I found the flavor to be very similar to that of the imported article, though not fully equal to it, for the simple reason that only a portion of the female flowers had developed seeds as a result of the rude manner of fertilization. This experiment proves conclusively to my own mind that the wild fig and the *Blastophaga* are necessary for the production of the Smyrna fig. The figs in the green state are palatable, but it is only after being dried that they acquire that fine, aromatic flavor which entitled them to be called the "king" of all dried fruits.

This year I repeated the experiments on a more extensive scale, and succeeded in obtaining one hundred and fifty fruits. Several gentlemen who are now present have tasted them, and will, I believe, testify to their well-defined resemblance in flavor to the imported article. There is not the slightest doubt in my mind that we have in California the true Smyrna variety, as well as the wild, or caprifig, and all that is necessary for the successful production of this most delicious of dried fruits is the little wasp, "*Blastophaga*." Some very valuable parasites for the destruction of scale insects have been successfully imported into this country, and there is no reason why the *Blastophaga* should not be introduced. If the State Board of Horticulture, the Director of the

Agricultural Department, or probably better, the Director of the Entomological Department at Washington, could be interested in this matter, I believe there would be no difficulty in bringing out the insect in a live condition. We as individuals can, of course, import the insect, but the Government, through its departments, has a much better chance of success.

In connection with this subject I take the liberty of stating that besides the Smyrna and wild figs, we also imported the following varieties: Cassaba and Bardadjik, and three other sorts of which I have no description. None of these varieties will produce fruit unless the flowers are fertilized, the fruit falling off prematurely if not caprifried.

The Cassaba fig is small, of a dark green color, and the pulp is of a highly colored red tint; is for table use, and does not dry well. Bardadjik has a longer stem than the Aidin fig, is pyriform, and is shaped very much like a water jar, from which it derives its name; the skin is yellowish green, the pulp of a greenish tint; the fruit is delicious when green, and when dried is preferred by the Smyrna residents to the Aidin fig. When dried the fig is small, but is very highly flavored.

California stands to-day as the only rival of Europe in the successful production of raisins, olives, wine, and prunes, figs being the only staple product wanting in the list, and it will be but a few years when it can be included.

THE NICARAGUA CANAL.

MR. CLAYTON offered the following resolution:

WHEREAS, The construction of the Nicaragua Canal is of the utmost importance to the Pacific Coast, and especially to California, in giving speedy communication with our Eastern cities, and with Europe; and whereas, the ownership of the same by the United States is, in our judgment, an absolute necessity to the future welfare of that part of the United States lying on the Pacific Coast; therefore, be it

Resolved, That this Convention recommend our Senators and Representatives in Congress to urge the building thereof by our Government, or to furnish aid to the present company by guaranteeing their bonds to a sufficient amount to pay for its immediate construction.

Adopted.

MR. BUCK: I wish to ask those committees that I have appointed to report at the evening session.

REPORT OF COMMITTEE ON MR. LUBIN'S PAPER.

MR. PRESIDENT: Your committee appointed to take into consideration the paper of Mr. Lubin, and to recommend such action as the importance of the subject presented demands, herewith offer the following:

Resolved, That this Fruit Growers' Convention heartily indorse the plan of Mr. Lubin, and recognize therein the probable solution of the most difficult problem connected with our fruit industry, viz., the disposition of our fruit at a profit to the producer and at a low price to the consumer, without the intervention of middle men or commission merchants.

Resolved, That the experiment be first tried in San Francisco by some local county organization, and that the moral support of this Fruit Growers' Convention be pledged to any such an organization as will undertake the experiment.

N. W. MOTHERAL,
P. W. BUTLER,
D. LUBIN,
JOHN MARKELEY,
G. M. GRAY,
Committee.

Report adopted.

FRUIT CONSUMPTION—HOW TO INCREASE IT.

By C. H. ALLEN, of San José.

I have been invited to prepare an essay for this assembly upon the subject, "How to increase the consumption of California fruit." When I accepted that invitation I fully intended to prepare a paper, but during the four or five days I had in which I expected to perform that duty, the "grip" got hold of me, and I could do nothing but think, and not much of that, so I appear without a paper.

Political economy, in treating of the relations of man to the objects of his desire, divides the subject into three distinct branches: Production, distribution, and consumption. The division is a natural one, and one I think that will be profitable for us to observe; in fact, one which we have observed in the deliberations of this body. It is not strange that in a State like this, new as we are, that the first division should have absorbed a large portion of the attention of such a body as this; in fact, nine tenths of the deliberations of the horticultural meetings are devoted to the subject of production. How can we produce the best fruit? How shall we prepare it for the market? What are the courses we shall take up for the production? and subjects of that nature. All these belong under the general head of production.

The second subject, the matter of distribution, has, at this meeting, received a great deal of attention. How, after the fruit has been produced, after it has been prepared for market, shall it be distributed? These, as I say, we have already discussed; they have formed a large part of the discussions of to-day.

To the third, the matter of fruit consumption, we have given very little attention, and for the short time I occupy your attention I desire to speak almost entirely upon "fruit consumption."

It is no use for us to produce large quantities of fruit, if we cannot find a market for it when it is produced; and the making of our market, and the making of our fruit so well known that it will command a market, or that it will be demanded in the market, is, of course, a vital question for us. The matter of production has been carried to such an extent that we are now anxious for the market. It is not many years ago when the same crop that was produced upon my place was taken off of my hands by dealers in San José at 17 cents per pound. At that time we did not need to discuss the question of fruit consumption. All the fruit that could be raised was consumed right around there. There was no trouble about marketing it. The crop this year hangs fire at 5 or 5½ cents per pound for dried fruit. Now, that shows that the production has increased far beyond the point of consumption. Now, how shall we increase the amount of fruit consumption? In the first place, our fruit, if we want it readily marketed, must be honest fruit. It must be put on the market and be what it is claimed to be. We are making the fruit better and better every year. The prunes I have been preparing this year are far better than the prunes I got 17 cents per pound for a number of years ago. I have learned more about it; they are just as nice as they were then. But our fruit trade has been sadly interfered with, because our fruit growers and fruit dealers, forsooth, are not all honest men. Not many years ago, when there was a great demand for the Yellow Egg plum, the fruit growers in our part of the State pulled

their prunes not over one half or two thirds grown, and sold them to the canneries. These were canned and sent East for the "Yellow Egg plum." There was an immediate gain of 3 cents per pound, but it paralyzed the trade for Egg plums, and the same thing has been done with the Silver prunes. I sold my Silver prunes two years in succession for 16 and 17 cents; now you can hardly get 7 or 8 cents. We are paying for that dishonesty; and so, you see, if we are going to get a good market, it must be by square, honest dealing.

The second point I make is, that we must learn to produce our fruit so cheaply that it can be sold at rates that will bring it within the reach of the poorer classes of our country. Dried fruit is the poor man's fruit; wealthy persons eat canned fruit, but the laboring man who supports his family by the sweat of his face, the man who works at day's labor, is the man on whom we must rely for the marketing of our dried fruits. Our dried fruits, therefore, must be raised and prepared in such a way that they can be bought at a very low rate. When I got 17 cents a pound I made an enormous profit. If I should sell them this year at 9 cents a pound I should make a fair profit. We must be prepared to work more economically if we want to bring our fruits down where the poor fellow can afford to buy it. We must learn how to prepare fruits for the various markets. I came into the possession of a fact not long ago, which seems to me to be a vital one for fruit growers, and that again illustrates the point I wish to make. Medical authority has decided that the acid of the apricot seems to be just exactly what is needed for the prevention of scurvy, and, if this be true, we will have the navies of the world to supply. But they must be sold cheap, or else they will not buy them. You can go right into the orchards and put them into the cans there and make a good profit at 4 cents per pound. Of course, there may be finer ones put up, but you must study the matter of consumption, and this is especially so with our larger fruits. Two years ago an entire shipload of our cheap prunes in sacks went on board of an English vessel, to be carried over to England for the sailors to eat on board ship. Now, if we can raise cheap fruit we can have all the navies for a market for the apricot crop. Our ideas have generally been too high; we have been wanting big prices; we have been wanting to get rich too soon, but we must be patient and wait. Let us study the market for the various kinds of fruit. I have no doubt there could be a very large trade built up in England for our prunes, for they will compare with the best French prunes, but they will have to be differently prepared unless the consumers are educated up to the fact that this fruit must be cooked and not eaten out of the hand. At Almaden, near San José, they buy this fruit, and it is eaten entirely by the workmen, who take them in their dinner baskets and eat a dry handful of prunes out of their hands, uncooked, but it probably would be better for them if they were cooked.

The next point is this: We have come to that period in human existence, in this country, anyhow, where a thing to be known must be advertised. Our fruit has not been advertised. If a man wants to introduce a new brand of cocoa he sends it out here and sends a drummer with it; he gets a corner in the Farmers Union store, and he sticks up a few dozen placards in town and invites every one to come from 2 to 4 o'clock to drink a cup of cocoa, and then everybody comes and buys that product, and in that way he gets it before the people; and so with a dozen other

things that we have been introducing in San José within the last two or three years. The placards are visible everywhere and the market has been made. Why cannot we do something of the kind? Consumption is largely a habit. People get into the habit of putting in so much stock in the fall for the winter supply. They have, in that part of the East where I passed my boyhood days and some of my early manhood, the habit of drying so many sacks of apples in the fall for the winter consumption. The earliest, bitterest, wormiest apples were dried, because the others would sell when these would not; they were quartered, cored, strung, and hung up on the rafters, and in various parts of the building, and the fruit for the year was accumulated. When so many apples had been pared and hung up—and I tell you truly that was the only fruit I ever ate until I was twenty years old, except dried figs or dates—they would consume them as they needed them. I say, then, that the matter of consumption is largely a matter of habit. We must get people into the habit of eating California fruit if we are going to sell it.

I was with "California on Wheels," and when I got east of Chicago I found very few persons indeed who knew anything about our California dried fruits. They would ask: "What is this?" "Where is this made?" "Where can we get that?" They wanted to know whether we had any dried apples in California, because they knew they would sell; but it never occurred to them that they could sell prunes, peaches, and apricots, but they knew they could dispose of dried apples. Why not push our fruit in this way by advertising it? I do not see why we should not have and use those large, attractive placards in this business that other people do in other industries. If we want to sell our fruit we must advertise it.

RESOLUTION.

MR. BLOCK: I made a motion in regard to the paper read by Mr. Rowley, that it be referred. In place of that I propose the following resolution, and I hope the same will be adopted:

WHEREAS, The present railroad charges on fruit shipped to the East from the Pacific Coast are in excess of our ability to pay and make business reasonably profitable; therefore, be it

Resolved, That we, the fruit growers in Convention assembled, hereby request the Southern Pacific Railroad Company to assist us in procuring a reduction of 25 per cent on present freight rates; and be it further

Resolved, That a copy of these resolutions be sent to the Southern Pacific Railroad Company by the Secretary of this Convention.

Adopted.

MR. BUCK: Mr. Caminetti, who has been elected as a member of Congress from this State, is present, and as there has been something said about a memorial to Congress, I am very glad that he is here. He told me he was perfectly willing to do, so far as his ability would allow, anything that the fruit growers of this State wanted. I think this would be an opportune time for the committee to report, and then we can listen to the remarks of Congressman Caminetti.

REPORT OF COMMITTEE.

MR. AIKEN: Your Committee on Congressional Memorials begs to report as follows:

MARYSVILLE, November 19, 1891.

To the State Fruit Growers' Convention:

Your committee appointed to draft memorials to Congress and the Secretary of Agriculture, and present the same to this Convention for adoption, respectfully submit memorials on the subjects referred; and upon adoption, recommends that copies be furnished to the California delegation in Congress and to the honorable Secretary of Agriculture.

W. H. AIKEN,
CHAS. H. ALLEN,
B. F. WALTON,
Committee.

MEMORIALS.

MARYSVILLE, CAL., November 19, 1891.

To the honorable the Secretary of Agriculture, Washington, D. C.:

Your petitioners, fruit growers of the State of California, in Convention assembled at Marysville, this nineteenth day of November, 1891, respectfully represent that their soil and climate are adapted to the successful production and preparation of fruit and fruit products of good quality, and in quantities sufficient eventually to supply the markets of the United States.

That the knowledge of the quantity and quality of foreign fruit products is of great value and importance to the horticulturists of this State.

Your petitioners therefore respectfully request your kind offices in obtaining and disseminating such information.

MARYSVILLE, CAL., November 19, 1891.

To the honorable the Senate and House of Representatives of the United States, in Congress assembled:

Your petitioners, the horticulturists of the State of California, in Convention assembled at Marysville, Cal., this nineteenth day of November, 1891, respectfully represent that they are engaged in the growth and preparation of fruit and fruit products for the markets of the United States, of good quality and in quantities to largely supply the demand.

That the adulteration and false and irresponsible labeling of fruit products, such as canned and dried fruits and olive oil, have become a serious obstacle to the profitable marketing of properly prepared and healthful articles of food in this country.

Your petitioners therefore respectfully request such legislation as will prohibit the adulteration of food products in this country, and the importation of such adulterated products.

REMARKS OF CONGRESSMAN CAMINETTI.

Hon. A. Caminetti, being introduced, spoke as follows:

I have been engaged for the last two or three weeks in making a tour of my district for the purpose of ascertaining the wants of the different counties composing it. I am very glad that I am, at this time, making a tour of this part of my district, and to come into contact with this Convention. Although I had not the pleasure of meeting you before, I am not a stranger to you, nor to your work. Being in the Legislature for eight years it was my pleasure, at each session, to fight gladly for the appropriation for the maintenance and support of the State Board of Horticulture. [Applause.] I am very glad to be able to say, that after an investigation of your work, I am not disappointed in having given you my aid in the past. I believe of all the Commissions that the State of California has supported within the last ten or twelve years, the State Board of Horticulture has done more good than all of them put together. Now, I am not talking for electioneering purposes, as the electioneering time has certainly past, and besides, my district is largely Republican; but I am talking for the purpose of ascertaining from the people, and from bodies like this, the wants and

requirements of the people of my district, and of the State. It has been my peculiar work in the Legislature to address myself, as far as my ability enabled me to do so, to topics bearing on the material advancement of the State, and to topics pertaining to school matters. I do not intend to go to Washington for a holiday, but go there for the purpose of doing the work that is expected of me, and this is my reason for going through my district, in order that I may form acquaintances from whom I can get information, in case, at any time during the progress of my work in Congress, it may be necessary to write back for information upon any subject that may arise.

I saw by the opening address of your President that there are several matters interesting your people and your industry that might come up properly before Congress, in addition to the matters you have laid out in the two memorials. I will say, as far as those memorials are concerned, I believe that they should be adopted. I believe Congress should look into them. I believe California and some other portions of the Pacific Coast are entirely different and distinct from any other section of the United States, and, I may say, of the world, having within their limits a great many climatic conditions. The rules that apply to the other States will not apply to California, therefore we must have a different rule of action. I propose, if it meets with the approbation of those interested in that particular, to offer for congressional consideration a bill to organize a bureau or department of agriculture, with its headquarters at San Francisco, bringing it nearer to the people to effect the work they intend to accomplish, so that those of you who are interested in agricultural or horticultural industry can apply to this bureau for the information that the Government should furnish. The Government has organized a Department of Agriculture by appointing a Secretary, and has given him a place in the Cabinet. It seems to me it could do no better, in providing for its development, than to attend to this peculiar want of the Pacific Coast. In order that I may succeed in this I may require assistance of all who are interested in this matter in California, and when I shall apply for that assistance I hope I shall receive it promptly, in order to enable me to carry on the work with vigor.

There are other questions that are liable to come up, and I have seen by the reports of this Convention they have already come up before you; for instance, the forestry question. In 1883 I introduced the first resolution in the Legislature of California having in view the protection of our forests, and I believe we have carried on an insane policy with respect to them. I believe we are on the road that Spain has long since traveled to her cost, and to whom we should look and profit by her experience. I believe all the unsold timber lands of the United States should be withdrawn from sale, and should be kept intact for the public benefit. I believe under the law we should look towards the planting of forest timber in some spots that do not now possess forests.

There was a letter read before this Convention asking that it take steps to prevent the county of Mariposa from getting six townships of land from the national reservation known as the "Yosemite National Park." I do not know the gentleman who read that letter, but I have just come from that section. I have taken special pains to go over those six townships, and I do not know why those people request that that should be withdrawn from the National Park. There is nothing

upon those six townships, with the exception of two sections containing the Merced grove of Big Trees and the Tuolumne grove of Big Trees, and, unless we desire to dismember the county of Mariposa, it seems to me that we should return the land that was taken, with the exception of the land including the two Big Tree groves. I speak advisedly; I speak from the investigation made by myself. Of course, there are lots of questions that are likely to come up.

I will say, in general terms, that I want it distinctly understood that this association, or any other association of like character in California, that may require any attention in Congress, shall have my individual efforts from the time that I arrive there until the session closes. I thank you sincerely for your attention. [Applause.]

ADOPTION OF MEMORIALS.

The question of adopting the memorials was put to a vote, and carried unanimously.

PEACH GROWING IN THE SACRAMENTO VALLEY.

By C. E. WILLIAMS, of Marysville.

I have been requested to present something for your consideration on the subject of the peach in the Sacramento Valley. Recognizing how little I know compared with some of you, I approach the subject with extreme reluctance and diffidence. I shall not attempt to discuss varieties most profitable or most easily grown, methods of pruning or cultivating, or, indeed, any of the details of the work of the peach grower, but will endeavor to present to you a few facts and ideas in regard to the business as a whole.

So far as my information goes, the first peach trees ever planted in the Sacramento Valley were set on the banks of the Yuba River, some two or three miles above the city of Marysville. There, in 1852, was planted the first peach orchard of this section, and probably the first in the State to assume prominence from a commercial standpoint, although peaches had been grown by the Spaniards for nearly one hundred years previously. From the small beginning there made by George C. Briggs, the business has increased until there are now in the Sacramento Valley and adjacent foothills almost two million peach trees, of which one and one quarter million are in bearing. A conservative estimate of the value of these orchards is from \$5,000,000 to \$6,000,000. The annual product is not less than one hundred and fifty million pounds, which should be worth not less than \$3,000,000, or a gross return of \$150 per acre. Of this \$3,000,000 a large part is expended for labor in the orchards, and other large amounts are paid by the canners, shippers, and driers who handle the product. This great sum of money is paid to the workingmen, who immediately distribute it among the various classes of merchants, and thus it at once enters into the regular channels of trade, benefiting all more or less.

That the business of growing peaches has increased beyond the expectation of its most sanguine and enthusiastic advocates of ten years since, we must all admit. It has come to be a leading industry, but it has had to advance to this position in the face of much doubt

expressed as to the success of those who put their money and time into it, and very much more doubt which only found expression in "acts louder than words." The planter of peach trees has been continually met with the question: "Are you going to have a market for your peaches?"

Most propositions have both a negative and an affirmative side, and this question, "Are we going too fast in the planting of peach trees?" is no exception to the rule. This question was, I presume, asked of Mr. Briggs and his associates shortly after their first trees commenced to bear. It has been repeated less and less frequently each year, as the acreage in peaches has increased, until the present season, when it has been more often heard than for several years. This is because of the extremely low prices that have prevailed in the East for all lines of our fruit—canned, dried, and fresh. It has given the croakers a chance to say that what they have been predicting has come to pass; that the whole business is on the verge of bankruptcy, and that another year or two will see the orchardists begin to uproot their trees or the Sheriff be in possession. Much of this kind of talk has been indulged in in this and all other parts of California during the past few months. Is it true? Has a peach orchard ceased to be good property? Have these talkers good ground for their talk? To all these questions I most emphatically answer, "No."

It is one of the unfortunate things connected with fruit growing that every few years the growers get more for their product than they should. It is unfortunate, because it always demoralizes the business at the consumer's end of the line. Last year it did this to such an extent that that alone is almost sufficient to account for the low prices now prevailing. When taken in connection with enormous fruit crops in the East, an early fruit season there and a late one here, a money panic which disturbed all trade, and has not yet lost its depressing effect, we have a sufficient array of reasons to account for our present depressed markets. This is still further aggravated by a warm fall and late commencement of winter in the East. This has been about equally true of all varieties of fruit, but has been most marked to us with peaches because we produce more peaches than any other one kind.

"But," says the owner of land well adapted to the growth of the peach, but not yet planted, "you have a fact staring you in the face: dried peaches are down to the cost of production, and while your theory, that they will be higher, may be right, I don't know it."

Dried peaches are not down to the cost of production. In an orchard in full bearing the cost of dried peaches in this vicinity should not be over 3 cents a pound, and I believe that some growers have reduced it to 2½ cents for every cost, including cultivating, spraying, and everything except interest on the capital invested; so that there should be a reasonable profit left at 6 or 7 cents a pound for the dried product.

But should the business be overdone, who will first be obliged to go to the wall? Evidently that grower who has the fewest advantages; and he who can produce the largest amount of the best fruit at the least cost will be the best able to withstand a period of depression, and will be the first to reap the benefit which must come later on from the resulting decrease of production. We claim for the best parts of the Sacramento Valley advantages in peach growing that are of much importance. "By their acts ye shall know them." Three of the largest canneries in

the State have for a long time shown their appreciation of our peaches: the Golden Gate Canning Company, by establishing a branch here in Marysville; A. Lusk & Co., by purchasing one of the largest orchards in Sutter County; and the San José Fruit Packing Company, by every year making purchases of Sutter County peaches and shipping them to San José to be canned. This shows the esteem in which our peaches are held by canners outside of our valley.

Leading shippers have said that on account of the earliness of ripening, and the high color and firmness of our fruit, there were few localities that could equal our immediate vicinity in the production of shipping peaches. When we take the whole Sacramento Valley into consideration, we find that it produces almost all the peaches shipped fresh from California.

But, however, it is in the line of dried peaches we can claim the greatest preëminence. Our growers can dry fruit for practically the cost of cutting and spreading it, except the expense of a dry house and the management of the same over some localities. Our fruit not being irrigated dries heavier than that which is grown on irrigated lands, averaging for peaches $5\frac{1}{2}$ to $6\frac{1}{2}$ pounds of green fruit to the pound dried, against $6\frac{1}{2}$ to 8 pounds from trees requiring irrigation. These are advantages to the peach growers possessed by our section. They are, however, of less importance than the matter of quality, quantity, and regularity of crops. What country can show a record of 9,600 pounds of peaches per acre from one hundred and sixty acres of two-year old trees; or 27,300 pounds from four-year old trees; or eight acres of two-year old trees producing \$3,000 worth of peaches, sold at an average of not quite 2 cents a pound; or six-year old trees producing 600 pounds, or at the rate of 30,000 pounds to the acre? Such instances might be multiplied until we were all tired. Growers of peaches on such land need have little to fear from overproduction.

But I do not want our friends from other parts of the State to think that I am predicting failure for them. I merely want to show that I believe that the best parts of the Sacramento Valley have less to fear than other less favored sections. To each locality some one variety of fruit seems to be best adapted, and that locality of right can boast of its preëminence in that fruit. I believe that we are justified in boasting of our peaches. We can challenge the world and not fear to find our equal. We acknowledge that other sections can grow as good or better apples, pears, apricots, grapes, or prunes. The peach stands near the head of fruits in point of popularity and in quantity used. The apple alone can question its supremacy. If the apple be king, then the peach is queen of the fruits. In the growing of this royal fruit we fear no rivals.

I have already touched upon a point which is of interest to us all—that of overproduction. We are not yet raising any peaches in California to speak of. Our product of dried peaches is only one half that of the raisin product. We have only exported about seventeen million pounds of dried peaches in any one year—enough for one good meal to each consumer in the United States. Our exports, by rail, of canned, dried, and fresh peaches have never exceeded two hundred million pounds, if all were reduced to green fruit. The average amount expended by the Eastern people, at the retail price, for our peaches, has never exceeded 20 cents for each hundred in population, or \$2,000,000.

These amounts, when put in the aggregate, seem large, but when reduced to the individual customer are ridiculously small. We are not producing many peaches, and there is room for more, but in order to make that room available we must make up our minds to grow and cure peaches at a price so that they can be sold to the average consumer—the man who works for a living. The grower must not think, as one gentleman told me last season, when he refused a fancy price for his peaches, that the Eastern people must have them, no matter what they cost. The Eastern people do not have to take our fruit. They can live without it, and they will, except in small quantities, unless they can buy it at a price that is reasonable. We are not yet growing enough fruit of any kind, if we are willing to grow it and not expect to pay for land and cost of improvements every year after the trees are two years old. We must consider that 10 cents a pound for choice dried peaches is like 2 cents a pound for wheat, something to be had very seldom, and even at 6 cents a pound we *can* grow more peaches than can be disposed of.

There are in Sutter County alone forty thousand to sixty thousand acres of excellent peach land, which is from two to three times the amount now planted in the whole Sacramento Valley, and forty times the present peach acreage in that county. Now, with such an area available for growing, it is useless to talk of what can be done. Such an acreage would require a force of ten thousand or twelve thousand men to pick and handle the crop during the busiest part of the season. The trees could easily be planted and cared for, but where would the labor supply to care for the crop come from? We could produce five hundred million pounds of peaches in Sutter County. We have only one twentieth of the acreage of the Sacramento Valley, and it is safe to assume that other counties could increase their product in the same proportion. But it is idle to talk of what can be done or to follow out those figures to the end, for we would reach amounts almost incomprehensible. It is equally foolish for any man to say that the business cannot be overdone. This does not, however, mean that it will be overdone. People are not rushing into the business with such undue rapidity as to make it dangerous. There will be periods of depression, as in other business, but in the main there is nothing to fear. There will be orchards planted that will be failures, but it will be the men who own and manage them who will be responsible for those failures.

To the man who owns peach land in this valley I would say: "Don't think you have a monopoly of choice fruit land. Don't think you can run a corner on peach growers. Don't think that the grower can afford to cover your land with twenty-dollar pieces in order that he may be permitted to plant peach trees on a small corner. Don't think that peach growing is all profit. If you fix your values on such a basis you will own the land for a long, long time. Sell land to the man who wants to set out an orchard, if you want to sell, at what it would be worth to the wheat grower, for that is the business that is going to cover the broad acres for many years to come."

To the man who is thinking of planting a peach orchard, I would say: "Come to Sutter or Yuba County. Choose carefully your soil. Don't think all land is alike. Don't even think that all parts of the same quarter-section are alike. Buy your land cheap, but don't buy cheap land. Study carefully successful orchards in your vicinity. Make selec-

tions of the right varieties. Plant and then cultivate. Cultivate your trees and fear not the result. Do good work and you will receive your reward. Don't expect to get rich from the first crop. If you do it will be an accident, and you will probably want so much orchard then that you will be worse off than if you had made less the first year. Don't do poor work. It pays nothing in any business, and a good deal less than that in fruit growing. Do all of these things well and you need fear none of the cries of the croakers."

DISCUSSION ON PEACH GROWING.

MR. LUBIN: In hearing that paper read and taking a bird's-eye view of it, I think it is a very interesting one. You are looking at this matter from a fruit grower's point of view. I suggested to the Chamber of Commerce some five or six years ago that it was the business of the merchant to aid in this work; that he should aid the progress of marketing the fruit; that they were better qualified to do so, in some respects, than the farmer; that the merchant can see and do things that are overlooked by the fruit grower. It reminds me a good deal of a man building a house, who put iron shutters in front and grated windows upon the top, and has forgotten all about the back door. Now, you can legislate and memorialize and pass resolutions that will have effect on transportation, but you cannot pass resolutions that will have the slightest effect on the men who are selling your products; you have not power enough to pass a resolution or act that will compel a man who sells your products to do anything of what you have been attempting to do. There was a gentleman here who said that fruit should be sold cheap and not at fancy prices, and yet I have heard remarks this morning that it was bringing 5 cents a pound—dried fruit. That is well enough, is it not? Now, I defy you to go into any grocery store in this city and buy it for 6 cents, which is a very high profit. You cannot do it now, unless you take steps to do what the gentleman said a little while ago, and put labels on your goods and put them in merchantable shape and sell them under your control. It is very well for you to protect the front end of your house, but unless you protect the other end, you can pass resolutions a mile long and a half mile deep, and they will not be worth the paper they are written on. You must follow the modes of trade, and unless you become a merchant as well as a producer, and get the laws of trade hammered into your heads, you will amount to nothing, and unless you do follow this out you will be at the mercy of the wind and air. How many of you eat chestnuts—5 cents worth in a year? I am not sure about that. I will guarantee that Italy puts more money into her citizens' pockets by the exportation to the United States of those chestnuts than we realize in prunes. Why? Because it is a product of food, and when the Italians come here they bring them with them and sell them on the street corner; but our dried fruit is sold in the grocery behind the counter.

MR. BUCK: I would like to believe and feel as Mr. Lubin, and if we could carry that plan out I think it would be just the thing; but I tell you when you undertake to ship green fruit three thousand miles away it will not keep quite as well as chestnuts. There is no question but

there are many abuses in all sections where fruit is sold at retail. The price paid by the wholesale man and the price paid by the consumer has a very wide margin. I only wish that I could see—and mind you, I am not saying this to say one word against the plan that Mr. Lubin is advocating, but would say amen to him or any other man who will attempt to carry out such a programme and plan of selling. If it could be successful it certainly would be the very thing for the fruit industry of this State. I have been East several times and have seen fruit arriving there, and I have seen it in such a condition that it had to be hauled onto the street very quickly and sold very quickly, too.

MR. MASLIN: I move that a committee of six be appointed to formulate a plan for the establishment of the Fruit Growers' Exchange in San Francisco, so as to carry into effect the plans and scheme of Mr. Lubin, by which means the fruit will go direct from the producer to the consumer.

Adopted.

COMMITTEE.

The President appointed John Markeley, of Geyserville; N. W. Motheral, of Hanford; S. J. Stabler, of Yuba City; R. P. McGlincy, of Campbell; D. Lubin, of Sacramento, and R. L. Bohannon, of Big Bend, Butte County.

Adjourned until 7:30 P. M.

EVENING SESSION.

THURSDAY, November 19, 1891.

Convention called to order at 7:30 o'clock.

President BUCK in the chair.

THE GUAVA, FROM SEED TO MARKET.

By R. C. ALLEN, of National City.

The guava belongs to the myrtle family and the genus *Psidium*. There are about one hundred species growing in the tropics and subtropics, mostly natives of America. Of these only a few bear edible fruit, the most universally known being the Pear-shaped guava, in California generally known as the Lemon guava. This variety grows as a tree-shaped shrub, twelve to twenty feet high. The leaves are entire, prominently ribbed, and somewhat downy on the under side. The fruit is about the size and shape of a Seckel pear, yellow outside and flesh-colored within. It has little value as a table fruit, few people caring for its peculiar flavor. However, the jelly made from it is held in high esteem, this being the variety used for the West Indian jelly commonly seen in our markets, and put up in wooden boxes.

It is not likely, nevertheless, that the Lemon guava will ever become popular in California, for it is very sensitive to frost, and properly belongs to a more tropical climate. It ripens its fruit in early winter, just when our weather is coldest, and has the additional objection of being very attractive to scale—as bad in this respect as the oleander.

The Red guava is a common variety in the East and West Indies, but seems to be unknown in this State. It resembles in tree and fruit the Lemon guava, except that the fruit is red, beautiful, but very acid. It is also used for jelly.

The species which has found most favor in California, and which seems to be perfectly at home in the conditions it finds here, is Cattley's, or the Purple guava. This variety was introduced into Europe from China, and in consequence called there the China guava, but it is now thought that it originated in Brazil. Here it is commonly known as the Strawberry guava, and it is safe to say that it will always be *the* guava of California.

This species is far hardier than the Lemon guava; scarcely more sensitive than the lemon itself. So far it has no enemies, always bright and clean, no matter what infests its neighbors. It favors a marine climate, succeeding most perfectly on the almost frostless mesas near the sea at San Diego and Santa Barbara. The hot, dry air of our interior valleys is against its best development. It requires abundant water, and, indeed, can hardly have too much. The perfect soil appears to be red mesa, underlaid at no great distance by red clay.

Commercially, this fruit is in its infancy with us. Hitherto it has been mostly planted as an interculture between citrus trees. This is objectionable, chiefly because the guava should be irrigated twice as often as the orange or lemon, so that in making one rule apply to both, one or the other must suffer. Then again, the guava is a gross feeder, and will be found before many years to have deprived the soil of much fertility.

The proper distance to plant is about eight feet by four. The bushes can be left at this distance for five years at least, and then trimmed out to eight by eight. They should be grown as bushes from the ground up, as this method of training facilitates picking, which is, at best, rather tedious.

The plants are generally grown from the seeds, which are very hard. They should be soaked thoroughly in hot water before planting. When the plants come into bearing a variety of strains will be found in the fruit, slight differences of shape and color. A longer experience will doubtless lead to developing the best types by budding, or by propagating by cuttings and layers.

There is a sub-variety of this species, having a yellow fruit, and known as the Yellow Cattley's. It is interesting chiefly as a curiosity, for it has no special superiority and lacks the strawberry flavor. The plants begin to bear at three years from the seed, and stand transplanting well. The fruit is about the size of an English walnut; on young bushes sometimes much larger; occasional specimens are found even two inches in diameter, but are very rare. The skin is deep red, indented, the inside red near the skin, shading to white at the center. Old bushes, unless severely cut back and fertilized, become sterile.

As fresh fruit the Strawberry guava easily leads all other kinds. Unlike the strawberry, its flavor can always be depended upon, and those who become accustomed to it nearly always end by preferring it to its namesake. It should be sliced, covered with sugar, and left to stand awhile before eating, care being taken to remove the astringent and blossom end. Excellent shortcakes, also, are made from it.

The fruit begins to ripen about the first of September, and successive

crops follow on until midwinter, or longer if there be no frosts. The first ripening which hangs on the bushes through the heat of summer is more astringent than the succeeding crops, and on that account less agreeable. Picked a little green it matures perfectly off the bush.

Guava jelly is generally acknowledged, in richness and flavor, to surpass all others. There are two methods of making the jelly in common use, namely, that of pressing out the juice from the raw fruit, and that of bringing the fruit to a boil before pressing. The latter method is to be preferred, not only on account of getting more juice to the weight of fruit, but especially because the distinctive flavor and coloring matter are chiefly next the skin, and the best of these qualities are left in the mash when the raw fruit is pressed. Made in this manner the jelly will be found to have the beautiful color and clearness of a rich Burgundy.

The cold-pressed juice yields a light pink or straw-colored jelly, deficient in fruit flavor, yet preferred by many who make lightness of color their standard of quality. It must be borne in mind, however, that if we expect to gain for this product an established position among the food delicacies of this country, it must be because of some positive quality, so that when people speak of California guava jelly, it will bring before their minds a distinctly characteristic thing. If they want something merely pretty with no particular flavor, they can make it in the East cheaper than we can furnish it. Nothing shows this more clearly than the example of imported guava jelly. With nothing to recommend it in the appearance either of the jelly itself or the package, its strong distinctive flavor has gained for it almost universal acceptance.

Our Strawberry guava jelly has a different flavor from the imported, more delicate, but very characteristic, still it should be given the benefit of all the qualities the fruit contains, and these, as before mentioned, lie chiefly next the skin, and can only be extracted by first heating the fruit.

A delicious jam can be made in the usual manner, the seeds being taken out with a coarse-meshed copper sieve. This fruit is sensitive to the slightest touch of iron, which turns the juice almost black. It is safer to use brass kettles for boiling, although granite iron or blue fruit-ware will do. The press must be carefully overhauled, and every iron nail or screw with which the juice can come in contact replaced with brass; the iron bands on the basket by copper, which must be frequently taken off and cleaned. In making jam it is necessary to remove the astringent blossom end, but in jelly it rather improves the flavor.

This branch of fruit industry is too new to be beyond the experimental stage, yet the prospects seem bright that an honest and meritorious article will find its place. It is unfortunate that some adulterated guava jellies are already upon the market, the name on the label being the chief clue by which the contents of the glass may be identified. As in olive oil, the known purity of our product will be indispensable to success.

THE DATE.

By J. M. ASHER, of El Cajon.

Not having statistics at hand I cannot give a tabulated statement of the importation of the date as an article of commerce, but will try to give an item or two that may interest some of the members of the Convention.

"*Phœnix* (the old Greek name of the tree, used by Theophrastus); Date Palm; synonyms, *Elati*, *Fulchironia*, *Phoniphora*; order *Palmea*. A genus comprising about a dozen species of palms, natives of tropical and sub-tropical Asia and Africa. Flowers yellow, mediocre; spikes growing out from amongst the leaves, and bearing flowers of one sex only, the two sexes being upon different trees. Both kinds have a cup-shaped, three-toothed calyx, and a corolla of three petals, with their edges valvate in the male and overlapping in the female, the former containing usually six (very rarely three or nine) stamens, with hardly any filaments, and narrow erect anthers, and the latter three distinct ovaries, with sessile, hooked stigmas. Only one of the ovaries, however, comes to perfection and ripens into a one-seeded fleshy fruit, the seed being composed of horny albumen, with a groove down the front, and the embryo placed at the back. Leaves terminal, spreading, and recurved, unequally pinnate; segments somewhat fascicled or almost equidistant, elongate-lanceolate, or ensiform, acuminate, with entire margins. Trunks, when present, usually rising to a great height, and covered thickly with scars of fallen leaves."

The species are readily raised from seed.

"*Phœnix dactylifera* (date-bearing); Common Date Palm. Flower, male panicles white, compact, six to nine inches long, on a short peduncle, the flower sweet-scented; female spike twelve to twenty-four inches long. Fruit generally reddish or yellowish brown when ripe, oblong, one to three inches long; pulp fleshy, sweet. Leaf gray, pinnae eight to sixteen inches long, regularly distichous, often approximate in twos or threes on the same side of petiole, which is gray, laterally compressed, almost flat. Trunk covered with the persistent bases of petioles, the foot often surrounded by a dense mass of root suckers. Height in its native country, one hundred to one hundred and twenty feet. A handsome, erect-growing palm, the fruit of which is well known in the United States as an article of commerce. In its native regions nearly every part of the plant is applied to some useful purpose."

I have eight or ten kinds of the *Phœnix*; four *Phœnix dactylifera*, and seven or eight others that were sent to me as *P. dactylifera* by the Commissioner of Agriculture. The latter came into bloom in the spring of 1888. One proved to be staminate (male) and the balance pistillate (female).

The pollen from the one was applied to three of the others, purposely skipping the balance. Those skipped bore no perfect fruit, but the three that were pollenized were full of perfect fruit. One tree having nine branches averaged about seven hundred fruits each to the branch. My children liked the fruit, but it was so small it had no commercial value. The fruit having no value was allowed to drop to the ground, where, the following spring, it came up as thick as wheat under the trees.

In the spring of 1889 we pollenized those that had been omitted the

year before, and also one of those that fruited in 1888, with the same result as last year, viz.: only those pollenized perfected fruit. These palms are dark green, with beautifully recurved leaves, pleasant to look at.

One of the four *Phœnix dactylifera* referred to came into bloom this spring, and was fertilized (by hand) with pollen from a tree growing nearly a mile away, and now has four nice bunches of green dates of good size and promise. The leaves of these trees are much more erect than the last named, and are of a grayish color; fruit now one and one half to one and three quarters inches long.

In seeking for information to make this paper more interesting, I wrote to Hon. F. A. Kimball, who kindly responded, in part, as follows:

"During the month of October, 1890, I received a consignment of eight varieties of Arabian date plants, as follows: Two plants each of Amhat, Naklehel Pasha Sewah, Hazaneh, Geb el Abeel, Sutteneh, Ameuch, Rashiideh, and one male date. These plants were secured through United States Pomologist H. E. Van Deman, Washington, D. C., whose untiring industry has enriched California with many new and valuable plants.

"An extended correspondence with the department over which Professor Van Deman presides, resulted in an arrangement by which I was to receive the plants and distribute (to Southern Pacific Railroad Company in Arizona) one half of them, plant and take care of the other half, etc. All of these plants are doing well. I also received, October 10, 1891, from Professor Van Deman, one plant of the Fard date, which is represented to be the finest fruit of all the family, wonderfully productive, and an exceedingly beautiful tree—in color entirely different from all the others, being of a light bluish tint.

"Some of the varieties represented in the collection attain a height of sixty to eighty feet. The natural habitat of the date palm does not cover a great range of latitude—the north of Africa, the southwesterly and easterly portions of Asia. These, with India and the Canary Islands, embrace the more important countries from which the date is exported."

In religious celebrations the leaves of the palm are made use of by both Jews and Christians, and trees are planted for this purpose only in countries too cold to insure fruiting.

African dates as imported to our markets contain more than one half their weight of sugar.

As the product from the seeds of the date is so uncertain, and the expense so great to import the suckers, I think it will be many years before the date as an article of commerce will amount to much; but there are many places in this State where it would be well to experiment with it with a good hope of ultimate success.

PROCESS FOR COOKING DRIED APRICOTS.

By A. D. WILLIAMS, of Santa Paula.

I have been in the business of drying fruit for eighteen years, from 1873; I put eight years in Delaware, and the balance in this State. In the apricot I find there is a great deal of acid. At this meeting there has been no question raised in regard to the taste of sulphur

on the fruit. Now, sulphur will not taste on fruit properly cooked, and people throughout the East do not understand why this taste should exist, but it is simply because the fruit is not properly cooked. Some will soak it just a little while and then cook it in the water that it is soaked in. That may all be well enough with prunes, but for fruit that contains the acid that apricots do it will not do. I have been cooking apricots for the last few years by steaming them in an ordinary steamer over a pot of boiling water. Perhaps there are some in this audience who have done it the same way; they say there are a good many in California who do it in that way, but throughout the Eastern country, where the introduction of apricots should be looked after more, this manner of cooking fruits should be introduced, and it will have to be done by the State Board of Horticulture in this State in the same way.

This method is very simple. In the first place the fruit is scalded in hot water from six to eight minutes, and then left to soak in the water twenty-four hours, until the fruit has come to its natural size, and while the fruit is cooking make a syrup proportionate to the fruit you have.

The scalding process has a tendency to loosen the skin from the apricot, and after it is loosened you can peel it off very readily.

Scald the fruit first in hot water from six to eight minutes; then let it soak in cold water twenty-four hours, or until all fruit is its natural size before drying. Cook in a steamer over a pot of boiling water about ten minutes. When it is done put in a dish. While fruit is cooking make a syrup of sugar, with the usual amount of sugar it would take in proportion to amount of fruit. Pour syrup on fruit while hot; let stand until cold, when it is ready for use.

Apricots cooked in the above manner are equal to any canned goods put up.

JELLY-CURED CALIFORNIA APRICOTS.

This fruit is prepared in the orchards of California, by a system, the result of much careful experiment and expense, whereby the surplus of moisture is removed, the fruit, however, retaining all the rich, delicious flavor and nutriment of the natural state. It is sent East in bulk and the syrup added.

The care and cleanliness exercised in its preparation are equal in every respect to those used in packing the best canned goods, while the quality of the fruit is superior, in that it is picked fully ripe from the tree, possessing to its utmost the richness of flavor noted in all California fruits, while fruit for the standard canned is picked from three to five days before it is ripe, to stand transportation to the cannery.

Comparison of a 25-cent standard tin can of apricots with a quart of jelly-cured, in bulk, is as follows:

JELLY-CURED.	STANDARD CAN.
Sixty to seventy-five pieces fully matured fruits. About one half pound best granulated sugar. No glucose.	Twenty to twenty-five pieces, frequently hard and unripe fruit. A proportion of sugar, often largely glucose.
Actual weight of fruit and syrup, two and one half pounds.	Actual weight of can, fruit, and syrup, about two and a quarter pounds.

This fruit is sold in bulk (like oysters), by the quart or pint, by all grocers, at 25 cents per quart.

BULBOUS AND TUBEROUS ROOTED PLANTS.

By MRS. ELLWOOD COOPER, of Santa Barbara.

This class of plants do so well in California that it is a constant wonder to me that we do not have them in more abundance and in greater variety. They endure the long drought, and respond quickly to irrigation; and blooming as they do at different times throughout the year, flowers from one or another species of them can be counted on for nearly every month.

In *January* our gardens are enlivened by the Paper White Narcissus, and the low-growing, beautiful pink Oxalis, with its delicate yellow center, and they should be planted in masses, as they come at a time when flowers are scarce, and at a season when the ground and atmosphere are moist—conditions necessary to the family.

February brings us the Crocus. Of these the "Monster Yellow" is the best. It never fails to yield its bright yellow blooms. The early Jonquils, too, are out, making glad every lover of spring flowers. These should be had in such quantity that each garden could give a handful to enliven a dwelling whose inmates are not so fortunately situated as to grow them. Flowers, as gifts, have special value, for they excite emotions in the soul which tend always to promote higher and better thoughts. By them the rich are turned to the contemplation of the beautiful, the poor for the time being forget the strain of their labor, the sick and afflicted feel more lightly their distress, and the unfortunate prisoner feels awakening within him memories of his innocent childhood, which if kept aroused might reinstate him in his manhood. So carry these gifts everywhere—to the mansions of the wealthy, to the cottages of the poor, to the hospitals for the suffering, and to the prisons for the sin-burdened inmates. But while I am moralizing I am neglecting to notice the Freesias and Hyacinths along the borders, which make us know of their presence by the fragrance with which they fill the air around them.

March is ushered in with the various members of the gay Narcissus family. Too much cannot be said in praise of these beautiful garden flowers, of which there are several marked sections, which can be seen and studied in every florist's catalogue. They are all hardy and beautiful, and given good, sandy loam and a little covering of manure in the fall, will come up every year and give you in profusion of their sweetness and beauty. I would like to say much more about this classical plant, which I am glad to notice is coming to the front as a fashionable flower. May the fashion continue long, and may we see as much interest taken in the Narcissus as in the Chrysanthemum.

But I must hurry away to other beauties waiting to be noticed. Sparaxis, Hyacinths, Tritelias, Lachenalias, Oxalis lutea are on every side shining in the warm sunlight, lighting up the walks with such beauty as to make staying indoors impossible. Much could be said of each and all of these, but I lingered so long among the Daffodils that *April* is here upon me, and I must hasten to call your attention to the Anemones and Ranunculuses, with their lively and various hues. Hosts of other beautiful flowers are keeping them company, making this month also a time of delight: Ornithogalums, Richardias, Irises, Ixias, Oxalis florabunda, both pink and white, Tulips, especially Tulipa gesneria, because it adapts itself to the climate, or rather to the season. Many

of last month's flowers are still fresh and bright. This being the month when so many bulbs are in bloom, care should be taken to have all the conditions necessary for the best results.

With *May* comes the more showy flowering bulbs. Amaryllises of various kinds, with their many hybrids all fine in coloring, *Lilium longiflorum*, and *Harissii* are in perfection. The Cannas, too, are showing out their gay colors. We do not have as many of these fine flowering bulbs as we should, seeing they do so well in the open ground, and are increased so readily by offsets, as well as by seeds, in which they are so prolific.

In *June* we have the so-called summer bulbs: *Agapanthes*, both blue and white, and there is a variegated-leaved one with blue flowers, useful among decorative foliage plants; *Amaryllis aulica*, majestic in size, gorgeous in color, well named "Lily of the Palace;" here it might be found in every cottage garden; *Hemerocallis fulva*, with its orange-colored flowers; *Lilium humboldtii* and *Lilium candidum*, the sweetest and purest in color of all the lilies; *Tritonias*, in brilliant orange and other colors; *Alstromerias gladiolas*, and the stately *Tritonia nobilis*, with its flame-colored spikes on stems eight or ten feet high, especially fine for sub-tropical gardening.

July opens with another fine Amaryllis, the beautiful pink *Belladonna*, with its fine clusters of bloom. It has the first rank among the bulbs of this month, and it is well set off with *Chinums* of different kinds, and the nearly allied *Pancratiums*. Both of these groups have curious white, sweet-scented flowers, which look well among their luxuriant foliage. Near them are seen the *Zephyranthes*, lovely, bright little things, some pink and some white. Then the *Hemerocallis flava*, sometimes called the Yellow Lily, adds much by its color to this collection. Dahlias, too, are in bloom now, among strong-growing plants.

And now comes *August* to give us the *Vallota* or Scarborough lily, the *Nerines* or Guernsey lilies, *Sternbergias*, *Colchicums* or Fall Crocus; choice, every one of them, and of easiest culture, which a little experience soon teaches.

September bloom is a continuation of the preceding month, with the addition of a later variety of the *Amaryllis belladonna*, and even more beautiful than the July one. Dahlias and Cannas are of first importance now.

October, *November*, and *December* are not altogether deprived of interest as regards blooming bulbs, for the rare *Veltheimia*, with its spikes of pleasing pink flowers a foot or more in height, continues for months to brighten the border, and *Imantophyllum miniatum*, with its Pompeian red clusters set in its dark green leaves, is an effective plant, and *Amaryllis aulica* gives many an occasional bloom during these months. Some of the *Hæmanthus*, too, in sheltered places will send up their spikes of red.

This summary of blooming bulbs is made up from notes written down in a garden book from month to month during this year. It shows what can be done with bulbs therein mentioned. Many other interesting and beautiful plants of this class would thrive well here, and should be introduced. They might be somewhat expensive at first, but when once established in this State, so favorable on account of its soil and climate to many plants that in places less favored have to be grown in pots inside, thereby hindering the more rapid propagation which free soil

and genial atmosphere would favor, they would soon become more plentiful and cheaper.

I have sometimes thought that if our wealthy citizens of leisure, when traveling in foreign lands, would bring on their return some of the choice and rare plants which came under their notice, and give them into the hands of skillful and careful gardeners to propagate and introduce, it would benefit us greatly. In this way England has filled her gardens from all parts of the globe, her citizens abroad taking pride in obtaining and sending home new plants to enrich her collection.

Bulbs are so easily transported that we might in a short time have a much greater variety. But the bulbous plants of our own State are not seen in many gardens, and we have many growing in different localities. *Alliums*, *Bloemeria*, *Brodiaëas*, *Brevoortia*, *Liliumstritillarias*, *Erythroniums*, *Calochortus*, *Trilliums* are all valuable and desirable, and if once introduced and established would become residents of the soil.

There are many interesting things in this class of plants that I have not referred to, which should be noticed, but mention of all would enlarge my paper beyond the limits of its design. I would like to see an essay confined to Lilies proper from the pen of some one thoroughly experienced in the growth of every one of them, giving the minor details of their culture. I am told that Lilies are grown very successfully in kerosene cans sunk in the ground, with holes punched in the bottom to secure good drainage, and filled first with broken rock and coarse gravel three or four inches deep, and above this good soil mixed with leaf mold. Lilies do not like manure, but thrive well in leaf mold.

Begonias I have not touched upon, and they are now a very important part of the flower garden. I refer, of course, to the tuberous-rooted kinds. I have not been able to give them much attention as yet, but mean to do so.

Brief mention must be made of the Water Lily garden that gives us, among other lovely things, the Sacred Lotus of Egypt, long regarded by every one as the most beautiful of all Lilies. Since Mr. Sturtevant has shown us how easily it can be grown, there is no reason why every one should not look upon its wonderful loveliness. An additional interest has been added to this plant by the issuing of Professor Goodyear's "Grammar of the Lotus," proving that it has been "the basis of most of the ornamental patterns of Greek and later times."

A Water Lily garden is another beautiful study of nature brought within the reach of all who take pleasure in plant life. As we walk in our gardens among the Lilies we are reminded of the great teachers of the past. First of Homer, who, twenty-five hundred years ago, said of the Asphodel, that it grew in the flowering meadows of Elysium, on which only the pure in heart were allowed to tread. The Daffodils call to mind the grand works of Shakespeare: "They come before the swallow dares, and take the winds of March with beauty." But greatest of all are the words of the Master: "Consider the Lilies of the field how they grow; they toil not neither do they spin, and yet I say unto you, that Solomon in all his glory was not arrayed like one of these."

SMALL FRUITS.

By MRS. L. U. McCANN, of Santa Cruz.

I belong to the vanguard of the great army of women whom the evolution of the age has freed from many a cumbersome care, and who look up to the wide open doors of horticulture for possibilities undreamed of by their mothers; therefore, I make a plea for women in your horticultural meetings, and I stand to-day in good and regular standing as a regular nurseryman and horticulturist, whose name is enrolled upon your books. [Applause.]

Nearly twenty-five years ago I became owner of a few acres of California soil. My first thought was, looking back to my old childhood home, Oh, what a raspberry patch or strawberry patch I will have! My name was not on the list of every nurseryman, and I thought, to secure my fruit, I would have to simply ride out to some farmer's wife and say: "I would like to buy some strawberry and raspberry plants." I had a very intelligent woman who brought me butter week after week, so I thought, without doubt, I should find a supply. I rode out to her husband's ranch and I told him I felt as though I would like to get some strawberry, or blackberry, or raspberry plants; have you any to spare? "My child," he said, "you ain't been long in this air country." His wife said: "I have been trying," and the tears came into her eyes, "ever since I have been living here on this old ranch, to get my husband to put in some small fruits. I told him that my girls would do all the picking if he would only give us the start; and many times when he would be heated and tired so that he couldn't eat his pork and beans, that if I had a nice dish of raspberries or strawberries, something cool and fresh with cream, he would have a relish for his whole dinner afterwards, and would have been a better man for the whole week." [Applause.] But he said: "No; we can buy them cheaper;" and the result is the miserably dried-up things they get in the market, maybe once or twice a year, which are all the berries that are seen.

Gentlemen and farmers and fruit growers, if this shoe pinches any of you, I hope it will pinch so hard that you will go home and plant some berries. [Applause.] I think most of the guess-work concerning the culture of small fruits would be done away with if you understood, once for all, that they are perennials, or biennials rather. That means the plant which sends the young shoot up with the first spring rain, grows that fruit one year, bears fruit upon that young sucker the next year, and at the end of that season has done its work, and must be cut down to make way for its successor. Hence, the knowledge of this fact gives us the process of pruning in berry culture, and, with very few exceptions, these plants are renewed by the Wise Providence who plans for the perpetuation of all good things to renew themselves by suckers springing from the root of the old plant, so that by the time the bearing cane is ready to be cut and burned, the successors are also ready to take their place. The only difficulty is that these newcomers must be thinned and taken away so as not to take away the strength of those remaining. This is true of the blackberries of the red and yellow varieties, with a few exceptions, and yet if you do not know that exception, and trim the black raspberry in the same fashion, you would cut yourself off from further fruit, and "kill the goose that lays the golden egg." When I have talked with people about the cultivation of black-

berries, they have said: "Oh, I have tried them once; they ain't any good for California; I have trimmed them in the fall, and that was the end of them; I never heard anything more of them afterwards, so I gave them up." I said: "You trimmed them in the fall, did you?" "Yes." "If you had noticed or known that there were tap-roots, you would have given it a little more thought; if you had noticed closely, as you should to be a successful horticulturist, that these young, tender, green branches were seeking the earth, that they knew what they were about, and went there for a purpose, you would have found a root-formation on the top, telling you what their intent was, and if you had made the study of the plant, you would find how easy it is, knowing what the nature of the plant is, to carry on its cultivation." In my own garden they are grown in rows, and I keep them about four feet apart, and when these young tendrils go down, they are taken and divided, the ground is loosened between the berries, and from both sides of the bush these tendrils are gathered together, a shovelful of earth thrown on them, being careful to keep them exactly in the line, which holds down these tendrils, and which keeps the shifting winds from breaking the tender roots, and when they are ready to take their positions as successors to the old plant, you can cut the old plant away on either side, and still have your plants four feet apart. Blackberries are also biennials, needing the old canes to be taken away, as the raspberries are, and then you must select your strongest and best successors after taking out the weak and unthrifty.

With regard to the after-growth of plants, much may be accomplished in your daily walk through the garden. The process of pruning is so simple that he who understands the nature of any plant may soon learn how much he may assist them as he walks through his garden. When the young raspberry shoot has gotten to be about eighteen inches above the ground, I pinch the tender top of it as I walk through my garden. By this process of pinching you start the laterals, and make the stalk grow firm and strong, and you have three, four, and six branches instead of one heavy one, and if they grow too thin I cut them back again. With blackberries, and with all other varieties you can do the same. I repeat, by this process of pinching the young or tender plant, you need do no heavy pruning beyond that, and the earlier I do this the stouter the plant is. There is but one caution: do not do your pruning so late in the fall—I am speaking particularly of my own locality, where we have no frost—as to produce a growth of wood that will be too new and tender to resist what slight frost you may have. To my mind there is a large plot of country lying between the top of the Coast Range down to the sea that is especially adapted to small fruit culture.

The processes of pruning and planting are very simple. In my own grounds, seeing that labor is the heaviest cost in planting or cultivating my garden, everything is done by horse-power, and the distance apart is just sufficient to let a single-horse cultivator go back and forth, if necessary, through the season, so as by cultivation to keep the ground loose and to allow the carrying of manure and other fertilizers, which is hauled on a sled that can run between the rows and facilitates the work.

Of course, you well know that strawberry culture is somewhat different from other plants, and if you are a wise student of nature the very fact of the production of so many runners will tell you that this

plant is a voracious feeder, and seeking forever new ground in which to plant its roots; therefore, keep your ground rich, and in the commencement of the season keep off these runners by continual clipping, if you do not want to exhaust your plant and cut short its fruit-producing power.

There is much to learn about strawberry culture. I learned it as most of us do, more from my mistakes than my successes. I am a careful nurseryman about keeping my plants distinct, and carefully labeled, so that the varieties may not be mixed. I had an old bed dug up and put under the finest cultivation that I knew how to give them, so as to be ready for my thousand new plants, which were a great expense to me. I think I had to do without a Sunday bonnet and a pair of gloves, or go without those thousand plants. I put them all to one side in this new bed. They grew very nicely, but they did not bear one single ripe berry. I learned the next season what that meant, as I found every last one of the thousand to be male plants, and it is not good for even a male strawberry to be alone.

Perhaps it might be interesting to tell you my experience with new fruits. I have in my ground a raspberry, called the Logan. This is hybridized by standing between a red raspberry and a wild blackberry, which gives a beautiful fruit almost an inch and a half long by an inch wide, of rich raspberry color. I have also hybridized a strawberry, which I should have called the "Great California," or the "Great Western," or the "Great Pacific," if all those names had not been taken by small and insignificant plants, and so I named my berry "The Tap-root," because it had a tap-root three feet long. I do not think that any other strawberry can compete with it. This year I have given it the severest test that I know of. I have placed it in my "experiment bed," for I believe it will solve the question of strawberries in places where there is no possibility for irrigation, and I wished to see how long it would do without water. I planted them in my experiment bed in single departments, and also planted others that were said to endure drought, and gave orders to my gardener that not one drop of water must go to that bed. Suicidal, perhaps, but I wished to test the very fullest power of this plant to live over the dry season, and to-day not one single strawberry out of the whole fifty planted there has died. The leaf has grown smaller, but life is still there, and it sends its deep tap-root down where it finds enough to live upon. I am still experimenting with it.

HOW TO PLANT A RAISIN VINEYARD.

By P. W. BUTLER, of Penryn.

Details of the latest method of making a vineyard are here given for the benefit of those who are about to engage in the industry of raisin making.

As the land must be irrigated, if it is not sufficiently level it must be made so that water may reach every part of it by flowing through open ditches. The ridges or knolls to be leveled can be plowed with two horses, one man driving the team and holding the plow. With four horses, and a scraper five feet wide, one man can do the leveling.

Levees can be built to conduct water to ridges at less expense, generally,

than ridges can be leveled. All levees should be made higher than the average ditch, with strong banks to insure against expensive breakings.

Distributing ditches and cross ditches should be made at distances not more than three hundred feet apart, to run the water to furrows that may be five to six feet apart. These furrows can be made with a plow and two horses, handled by one man.

In the main ditches from one to two headgates must be placed to each forty acres of land, so that the water may be properly controlled. The land is then ready for flooding. In all new ditches it is safer to flood before planting, as the ground often absorbs an immense quantity of water and settles unevenly. The land should be flooded from twelve to twenty-four hours, or until it is thoroughly well saturated; but more water should be given to the higher than the lower portions, and the lowest parts need have no water, as they will get plenty through percolation, and ditches need not be extended to such places.

After flooding the land should be again leveled before plowing. A leveling instrument should be used in surveying all main ditches.

Small ditches can be made by plowing with two horses, and then with a V and four horses the soil is thrown up at each side, and the process repeated until the ditches are sufficiently large. The scraper must be used in making the larger ditches.

It is well to have the first leveling done and main ditches made before the fall rains, as the soil is then dry and much lighter to handle than after it becomes wet. Bridges that are to cross ditches and all buildings should be made before the autumn rains.

Hay and grain for the use of horses should be bought during their harvesting, and taken direct from the field and stored where they are to be used.

Have constantly in stock extra fittings for all implements, that repairs may be made without loss of time; and such as are liable to be needed should be taken to the field each day. Have printed rules to govern labor of all kinds, and have them signed by all parties as employed. Hire men and horses at stated prices per day, when at work, and charge them board for each and every day, including Sundays.

A stake should be set by each vine as planted. They can be cheaply made from redwood posts four by six inches and seven feet long, that are sound and free from knots. Cut into blocks fourteen inches long, making six to each post. With a hand ax and maul split these blocks into squares of one third of an inch, or nine stakes to the square inch. Each post will then make about twelve hundred stakes, and six thousand can be made in a day by one man. These should be whitewashed, that they may be readily seen when plowing for irrigating and cultivating, before the foliage starts on the vine. This can be rapidly done by filling a bucket with whitewash, then grasp as many stakes as can be held in both hands and dip half their length in the wash, and spread in rows that they may dry quickly, as they will be much whiter than when dried slowly.

The land should be plowed not less than one foot deep. This can be done with a single plow drawn by four horses, or three horses, if they are large—one man to both drive and hold the plow.

If the ground is heavy it will be necessary to harrow it at once, and when lumpy it should be harrowed the second time. Smooth with a drag sixteen feet wide. This can be made of four planks one inch thick,

twelve inches wide, and sixteen feet long, nailed to four pieces of two by four-inch scantling four and one half feet long. Lap the plank one inch as nailed, bevel the ends of the joists, and nail another plank on the beveled ends, thus making a sled that will slide over the dirt without loading. This can be drawn by four horses, and will smooth the surface so the line will lie evenly on the ground as the planting is done. The planter should take the vines in the nursery, if possible, and have them dug under his own supervision, and only a few days before they are to be planted. Have them covered and wet as fast as dug. An ordinary hay wagon with a broad, closely-boarded platform, is a good vehicle in which to take them to the vineyard. Cover the platform with straw, then load the vines carefully, so as not to bruise or break the roots, with the tops on the outside. After loading, wet them thoroughly, and cover closely with canvas, binding it around the sides and ends to exclude the wind, and while in transit wet the canvas as often as it shows signs of becoming dry. Leave them at the vineyard at convenient places for distribution, near the water ditches. Now, get some old oil barrels, saw them in the middle to make tubs. Let each pruner take one of these tubs, into which put a few inches of water, and as each vine is pruned place the roots in the tub of water until full, when they can be taken to the planters or again heeled in the ground. Let the pruner take only one bundle of vines from the ground at a time, and sprinkle them if necessary, keeping them shaded while cutting, and not exposed to the wind. Cut off all the branches except the strongest one. Leave a spur of that one to two inches long that has one or two buds. The straggling roots that may be growing on the upper end of the vine may be removed, leaving only the roots at the lower end. These are to be clipped, leaving a length of four to six inches on the longest roots, but the smaller roots may be cut closer. The ends of all bruised roots must be cut inside of the part bruised. Positively reject all vines that have black-knot, or are bruised on the main stock, or have weak roots, or in any way show signs of being unhealthy, or that may by accident or otherwise have become dry after being taken from the nursery.

The vines can be hauled in tubs on sleds to the planters, the tubs having in them a few inches of water, in which the roots are set, and then put direct in the bucket of each planter, which also contains water, and the vine is taken from this bucket only as it is planted.

Vines must always be kept moist from the time they are taken from the ground in the nursery until planted in the vineyard. The popular distance apart at which vines are now planted is eight by twelve feet, or ten by ten feet. I prefer, however, to plant in equilateral triangles eleven and one half feet apart, which gives the same number per acre as squares of ten feet. I use lines composed of seven-strand galvanized cable wire of about one fourth inch in diameter and three hundred feet long. A stake is attached to each end of the line, made of gas pipe one and one half inches in diameter and two feet long, pointed at the end. Open the strands of the line two and one half feet from the end, insert a fine brass wire and wind it several times around the line and securely fasten. At the distance at which it is desired to have the vines planted apart this is repeated until the line is filled with the marks. Two lines are used in planting. After one line is set by two men the second line is set by the same men while the vines are being planted on the first line, and when done the line is thrown over the other and the men step

forward to plant, without losing time while the line is being set, as is the case when only one line is used.

By this method, I have for many days in succession planted forty acres per day with one crew of twenty-six men—nineteen men to plant two vines each on the line, two men and two teams to haul the vines in tubs to the planters, two men to distribute them to the buckets of the men, and one man to watch the work to see that every vine is honestly planted.

For a small vineyard less men are needed. The first row of vines should be planted about one rod from the fence, to give room to turn teams in cultivating.

Fences should be built immediately after planting, if not before. It is not necessary to fence against stock in the San Joaquin Valley, but hares must be kept from the vineyard. Redwood posts two by two inches, four feet long, driven in the ground ten inches, and set ten feet apart, to which attach wire netting three feet wide, makes a cheap and effective hare-proof fence.

Plow two furrows on each side of the fence, and then with a V turn up the soil against the netting, when the ground is *wet*, to a height of about six inches; it will then dry hard, and the hares will not burrow under it.

It is not absolutely necessary to irrigate immediately after planting, if done in the early season, and the land has been well flooded before plowing; but if the ground is at all dry, irrigation should follow at once. By plowing one furrow close to the vines, and filling it with water, it will percolate through the loose soil to the vine just planted, and thoroughly settle it around the roots; it will then grow with absolute certainty if the soil is ever after well cultivated, and not allowed to become too dry.

After the rains cease in the spring, irrigate once a month until September, to insure the best growth of vine. Plow deep furrows ten inches from the row of vines on each side, throwing the soil from the vine, then fill with water, but not to overflow or run outside of the furrows, and keep them filled for several hours, that the ground may become well saturated by percolation, but not wet on the surface outside of the furrows, or cultivation will be more difficult. In about two days, or as soon as the ground becomes sufficiently dry, turn the furrows back with a one-horse plow, and at once cultivate across the furrows and again at right angles. Hoe around the vines at the same time, thoroughly pulverizing the soil to a good depth. Borders of trees are now usually planted around vineyards. Olives, figs, or other fruit or nut trees are preferable to trees from which no income can be derived. These can be planted eighteen inches from the fence on the inside, in the edge of the bank thrown up against the fence; they can then be irrigated by water run along the gutter at the edge of the fence bank.

If suitable land is selected and planted according to the rules here given, the vines will make a completely satisfactory growth without loss, except by accident.

REPORT OF COMMITTEE.

MR. STABLER: Your committee to whom was referred the matter of affiliation with the Traffic Association, begs leave to report as follows:

To the Fruit Growers' Convention of the State of California:

Your committee to whom was referred the matter of affiliation with the "Traffic Association of California," would respectfully report that they met, and after a careful deliberation of the subject, recommend that this Convention urge upon its members and all fruit growers and shippers in this State the necessity of using their utmost endeavors to cause to be organized in their respective counties local Traffic Associations, to the end that said local Traffic Associations obtain a representation in said "Traffic Association of California," to act in concert with it, for the general benefit of the producing, manufacturing, and shipping interests of this State.

S. J. STABLER,
B. F. WALTON,
W. H. AIKEN,
Committee.

Adopted.

RESOLUTION.

MR. ALLEN, of San José, introduced the following resolution:

WHEREAS, The terms of office of the several members of the State Board of Horticulture have expired; and whereas, no appointments have been made by the Governor to fill those vacancies; therefore, be it

Resolved, That the fruit growers of the State of California, in annual Convention assembled, most earnestly and respectfully request that his Excellency Governor Markham reappoint the members whose terms of office have just expired.

MR. BUCK: I will only say, in a few words, that the State Board of Horticulture has been doing and is doing some good work, and the evidence of it is the attendance we have had at this hall from the time we rapped and called this Convention to order, on the 17th instant, till the present time. There have been no politics in the present Board, nor have there been since I have been in it. Whether all the members of the present Board are the best men that could be selected in the State I am not able to say, but I believe that they have done work that the horticulturists of this State are satisfied with, and I believe that their work has shown that the money intrusted to their care has been well spent, and not wasted, and for that reason I would ask you to indorse this resolution.

MR. ALLEN: Mr. President, I want to say that it needs only to be said that the members whose terms of office have expired comprise the names of Ellwood Cooper, Mr. Block, and of three others from whom we have always heard with pleasure and greatest profit.

MR. BUCK: I will state that the members of the Board whose terms of office have expired are Mr. Cooper, Mr. Thomas, Mr. Block, Mr. Runyon, and Mr. Mosher.

Resolution adopted unanimously.

COMMITTEE.

The President appointed C. H. Allen, of San José, R. B. Blowers, of Woodland, and Wm. Johnston, of Courtland.

REPORT OF COMMITTEE ON RESOLUTIONS.

MR. BRAINARD: The Committee on Resolutions begs to report as follows:

WHEREAS, The voice of every attendant at the present State Fruit Growers' Convention, held under the auspices of the State Board of Horticulture at Marysville, November 17-20, 1891, has been an expression of a feeling of agreeable satisfaction; that the same has in every way been pleasant, interesting, and profitable; and this measure of abundant success is in a large share due to the friendly, hospitable, and earnest coöperation of the citizens of Yuba and Sutter Counties to make it so; therefore, be it

Resolved, That this Convention would fall far short of duty if it should fail to place upon its records its full appreciation of these kindly efforts, so admirably planned and so enthusiastically carried out by the horticulturists and citizens of this locality; and be it further

Resolved, That the comfortable and homelike feeling engendered in every heart by the respectful and unostentatious reception, attention, and hospitality received at the hands of the good people of these two counties on whose borders we meet, has been a grand factor in making the sessions of the Convention so harmonious, so eminently practical and instructive to all who have been present; and be it further

Resolved, That, in view of all this, and the pleasant excursions planned to enable the visiting members to learn by practical observations in the orchards some of the methods practiced by horticulturists in this highly favored section, this Convention express to the people of Yuba and Sutter Counties, and in particular to those in the vicinity of Marysville and Yuba City, their obligations to them for these highly important favors, and to the committee having all the details in charge its earnest thanks, with the assurance that nothing has been lacking on their part to make this session of this Convention the perfectly successful one it has proved to be.

HENRY A. BRAINARD,
FRANK A. KIMBALL,
A. P. CRANE,
Committee.

Adopted.

RESOLUTION.

MR. McGLINCY offered the following:

Resolved, That a vote of thanks be tendered to the proprietors and publishers of the newspapers for the very extensive reports they have given of this Convention.

Adopted.

REPORT OF THE COMMITTEE ON EXHIBITS.

MR. PRESIDENT: Your Committee on the Exhibition began its labors at the close of the Convention this afternoon with the intention of examining such exhibit and reporting candidly upon its merits. But the extent of the exhibition, the variety of fruit displayed, and the number of exhibitors forbade, within the time to which we were limited, doing even partial justice to the matter. We concluded, therefore, to content ourselves with calling attention to the striking features of the exhibition.

We first desire to express our thanks, and the thanks of the Convention, to the generous and public-spirited gentlemen who so kindly contributed to the pleasure and information of the members of this Convention. There were fruits displayed which, for color, size, and freedom from the attacks of insects, are worthy of praise. The curing of the fruits, especially certain samples of dried fruit, prunes, and figs, seemed the acme of perfection.

The exhibition, apart from the excellence and flavor and perfection of form of the fruits, is most worthy of notice as an exponent of the climate of the State. Remember that this is the twentieth of November, and yet there were ripe oranges, pomegranates, persimmons, apples, a dozen varieties of table grapes, including the Thompson's Seedless, pears, quinces, and peaches, and many varieties of vegetables, and last, though not least, olive oil from San Diego County. Where in any land under the sun, save in California, could such a various collection of fruits and vegetables, at this season, be produced?

Whatever is new in California in the process of curing fruits and packing them in an artistic and tempting style should be noticed, and hence we beg to call attention to the collection of Mr. Mosher of fancy dried or semi-preserved fruits. They approach in appearance and elegant mode of packing the style which, heretofore, has made the French preparations so famous. We noticed in other samples prepared, we are informed, for the market, laudable attempts to ornament the fruit and packages.

Mr. Kimball exhibits bottles of virgin olive oil. This oil was sampled by the committee, and we pronounced that it has no superior; it is bland in taste, perfectly filtered, and of delicate flavor.

From the valleys to mountain altitudes of two thousand eight hundred feet above the sea, were gathered these fruits. Mr. Meek, of Camptonville, two thousand eight hundred feet above the sea, exhibited apples, pears, English walnuts, almonds, hickory and butternuts. He also exhibited a new apple, the Louvre, which is worthy of examination by apple growers. It is one of the handsomest of apples, and is said to keep two years. Especially do the apples from Humboldt County challenge admiration for their intense color and perfect form.

Among seedlings there are almonds, oranges, and apples.

Three mechanical inventions were presented, which to the committee seem perfection, judging by the work performed. One is an almond budder, for budding stick-fast almonds. Another is a pitting machine, called the "Freeman Fruit Pitter." Another is an invention to perform an operation which seemed hitherto to be impossible of performance.

It takes a clingstone peach, cuts it clean in half, and extracts the seed, without leaving any ragged edges or torn center.

It is to be regretted that time would not permit a catalogue, for permanent preservation, of the names of the contributors and the products exhibited, as so much seemed due to the exhibitors as a testimonial of our appreciation of their consideration for and entertainment of the Convention.

Respectfully submitted.

E. W. MASLIN,
R. B. BLOWERS,
LEONARD COATES,
Committee.

Adopted.

NEXT PLACE OF MEETING.

A letter from the Board of Trade of Visalia was read, inviting the Convention to hold its next session at Visalia. Also, telegrams were read from the Board of Trade and Chamber of Commerce of San José, inviting the Convention to hold its next session at San José.

MR. CLAYTON: I wish to place the name of San José in nomination. We will try and make your visit as pleasant as it has been here, even more so, because we have all the facilities for accommodation. It has been a long time since the Convention has met there—some nine or ten years—and the citizens feel that they ought to have a meeting there. If you select that place I am sure you will not regret it.

MR. ALLEN seconded the nomination of San José.

MR. MOTHERAL: I nominate Visalia.

MR. CAMPTON: I should like to see the Convention held in San José. It is a delightful place, plenty of room, and good roads.

MR. BUCK: I believe I voice the sentiment of the State Board of Horticulture when I say that it is not what we do for ourselves particularly, but what is for the benefit of those living in and around the sections where the meetings are held. Whatever place we select for the place of our next meeting, I hope we will have a generous attendance there.

MR. WAGNER: We have a little village in Nevada County—Grass Valley—of over seven thousand inhabitants, and I believe we could treat the next Convention with as much courtesy as any county in the State. I want to tell this Convention that it gives me pleasure to meet with you, and I appreciate your united efforts to promote the fruit industry, and I believe that Nevada County is fast coming to the front rank in this line, if T. J. Wagner of that county does say so. [Applause.] I feel it is an industry that is waking up faster in that county than in any other county in this State, and therefore I believe it needs some encouragement. I would like every man in this Convention and every lady to be in Grass Valley at the next Convention, if you decide to have it there.

MR. THOMAS: I withdraw the application of Visalia in favor of Grass Valley.

MR. BUCK: I will put the motion: first, that this meeting recommend that the next Convention be held at Grass Valley. Now, remember, those of you who vote "yea" in this case vote to carry this meeting to Grass Valley.

Lost.

MR. BUCK (proceeding): Now, as there is no other place named, all in favor of San José signify it by saying "yea."

Carried unanimously.

COLUMBIAN WORLD'S FAIR.

By GEORGE HUSSMANN, of Napa.

Will California be represented at the World's Exposition? You may think this an idle question in a State which was the first to take initial steps and has made a fair, though hardly large enough, appropriation towards making a display. But I have been looking on, and I may say here, that although a comparatively young Californian, living here in our glorious State only ten years, that none of you can surpass me in love for it, in appreciation of its great future, and in admiration of its great resources, surpassed, if even equaled, by none in the bright galaxy of States which Americans proudly call "our country." I firmly believe that Providence has destined us to be the greatest State in the Union, "the land where wine, milk, and honey flow," the Italy of "our country," which our great German poet, Goethe, seems to have had in his mind when he sang in his "longing for Italy:"

"Know'st thou the land where fragrant lemons bloom,
In cooling shade the golden orange glows;
Where tempered breezes blow from azure skies,
The myrtle low, and high the laurel rise."

But because I fully appreciate it I do not want to see a second class display. If we cannot surpass every other State in making a grander show, in doing justice to our capabilities, we had better stay at home altogether. I intend to go to that exposition, but if California cannot outstrip all competitors, I would not own that I am one of its citizens. If we make an exhibition at all, it must be one which will excel all others. We can do so, but will we do it? I fear not. There have been too many bickerings, too many local jealousies already. If this had not been the case the Superintendent of the Horticultural Department would have been a Californian. Newspaper men, however competent they may be to make a great newspaper, are not the best representatives of a great agricultural and horticultural State, because they are without that practical knowledge which alone enables them to judge of its vast resources. The rare plants from the countless localities which lie hidden in its mountain dells and cañons, if collected by a botanist, a man or woman, either, would form one of the most attractive features of the exhibit. The fauna and flora of our valleys and mountains, if properly collected and arranged, would be a revelation to the people of the Eastern States of which they had not dreamed, and which would be the father of the thought, "Let us go and see for ourselves and make this State our home."

It has well been called the golden opportunity for our State, and if we neglect to improve it, if we do not outshine all the other States, we had better stay away. We can easily excel, for where can you find a climate where the apple and pear, peach and apricot, plum and nectarine, cherry, quince, and grape, as well as all the small fruits, can be grown in one orchard, together with the fig and almond, walnut and olive, orange and lemon; where the fruits of the northern zone will flourish equally well with those of the tropics; where there is not a day in summer or winter but a bouquet may be culled from any garden fit to grace the table of a king. To you, who were born in this incomparable State, who have been familiar with it from your earliest childhood, this may not appear so wonderful as to those who, like myself, grew up in a colder clime, and we appreciate it, therefore, all the more. So will the

thousands who flock to this great exposition, and who have never seen California.

I have urged you once before, as agent for the department on a similar occasion, to contribute exhibits to the Paris Exposition. I am sorry to say that but few responded to my call, although I had several promises. Yet the meager exhibition we had at Paris resulted in the award of about fifty medals and diplomas for the State, and has attracted French experts to this State to examine its viticultural resources. One of the consequences has been a large order for our clarets (fifty thousand gallons) from France, and also orders for wines and brandies from England and Germany, which promise to amount to a million gallons within twelve months.

This is a home exhibit, so to say. We want to show to the world that America is the greatest, the most varied, the richest country on the globe. But we, as Californians, also ought to prove to them that we are the greatest State in the Union. Let the grain farmer bring his grain, the stock men a full representation of our noble herds, the mineral resources of the State be fully shown. And need I tell you, horticulturists of the State, what you can and ought to do? No State can claim such varied and excellent productions in your special line. You have the fruits, the vegetables, the flowers to make the greatest show on earth, but every one must furnish his best, and work with a will. We want united action; we want a continuous supply of fresh fruits, vegetables, and flowers during the entire duration of the exhibition, and to do this we want organized efforts.

Let me hope that such steps will be taken at this meeting as will secure a worthy representation, such as we may all be proud of. How this is to be done is for you to say, for in multitude of counsel there is wisdom. We cannot afford to lose this golden opportunity by small jealousies and bickerings. Let us work with a will, and altogether, remembering that great axiom, that the general welfare of the community is also the welfare of the individual.

LETTER FROM GENERAL CHIPMAN.

RED BLUFF, CAL., November 19, 1891.

B. M. LELONG, *Esq.*, *Secretary State Board of Horticulture, Marysville, Cal.*:

DEAR SIR: I am greatly disappointed to find myself so tied up in Court that I must forego the pleasure of meeting the Convention, and sharing the benefits which always come to those who attend.

You have many very interesting questions before you which I had hoped to hear discussed; but there is one I beg especially to urge, and that is, the necessity for a careful and intelligent republication of your proceedings from the earliest date of your meetings. There is great need for practical information upon fruit growing, and although Professor Wickson, in his "California Fruits," has done the State great service, as have you and others, in the preparation of valuable monographs upon individual topics, there is yet a mass of excellent material in your reports that cannot reach the general public, and is of the highest value. They should be edited, of course, with a view to sifting the wheat from the chaff, and giving the more important practical matter contained in them.

I sincerely hope this question will not be overlooked or postponed. The future greatness of California must rest largely with her growers of fruit trees and vines.

The fact that the value of fruit and wine exports for 1890 excelled in value our wheat exports, has placed the industry, of which the members of your Convention are among the most intelligent exponents, foremost in the State.

The results of your deliberations ought not to be hidden under a bushel. It is due to yourselves and to the noble calling for which you are working, to spread broadcast all possible information relating to fruit growing.

Wishing the Convention a most profitable session, I remain, sincerely yours,

N. P. CHIPMAN.

RESOLUTION.

MR. AIKEN offered the following:

Resolved, That we approve of and recommend the formation of County World's Fair Associations.

Adopted.

Recess was then taken until Friday evening.

EVENING SESSION.

FRIDAY, November 20, 1891.

Convention called to order at 7 o'clock P. M.

Acting President BUCK in the chair.

THE LEMON INDUSTRY.

By O. P. CHUBB, of San Bernardino.

It is evident that the citrus industry, in the direction of lemon-growing, is receiving a new impetus in the southern portion of this State; in fact there are strong indications of a boom in that line, and the question arises, is it expedient for orchardists to enter upon that branch of the fruit industry as a specialty, where the local conditions are favorable?

As a general proposition it would seem reasonable that the American market, at least, ought to belong to Americans; and since we have successfully competed with foreign production in other lines of fruit, may we not confidently now enter the lists in supplying our own people with so staple a product as prime lemons? Current statistics show that importations of this fruit are very steadily, if not rapidly, on the increase; and that its consumption is more than keeping pace with our ratio of growth in population. If California can furnish American markets with a quality of lemons equal in all respects to those received from Sicily, wherein lies the good sense of yielding so profitable a trade to that country?

Granting the premise as to quality, it becomes a matter of option with us whether the \$4,000,000 or \$5,000,000 annually paid by the people of this country for foreign lemons shall hereafter be retained for the benefit of American labor and home production. The problem to be solved then is, whether our growers can profitably produce, cure, pack, and put upon the market, when the demand is greatest, such fruit as will, if offered at a lesser price, and in sufficient quantity, wholly replace the imported article. It is hardly plausible that quality and condition will alone insure such a result, since past experience has begotten a prejudice among American dealers in favor of the foreign product; and only such concessions in prices as may appeal to their individual interests will enlist their coöperation. A carload of California lemons put upon the New York market in July—sampling equally well with a cargo fresh from the Mediterranean—must yet, by practical test, show that it will stand up as long in the retailers' hands, and the risk will not be assumed without some material inducement.

It is not a great while since San Francisco dealers were disposed to offer a relatively fair price for a certain few brands of California lemons, bearing the marks of intelligent and careful handling. And therein lies the secret of the whole business—of properly curing so as to compel the attention of dealers, whether they are actuated by State pride or otherwise. It is, moreover, the key to the situation in regard to the future entire control of the American market, not to mention others outside. When the Nicaragua Canal is completed we may perhaps look for other worlds to conquer, having established our supremacy at home meanwhile.

But can the average speculative, booming California lemon grower be relied upon to tie himself down to the requisite minutia of method—to the painstaking and slow process of making a first class lemon? And, having proved his ability, will he persist, and stay with the undertaking until both the dealer and consumer are satisfied that a California lemon is as good as a Sicily lemon in all respects? If so, then go in for California lemons and get squeezed to universal extent. It appears to me, however, that while a few will succeed in making the business profitable, the majority are liable to fail either from lack of sufficient capital or from inattention to details when harvest time comes.

Yet, I would not discourage the effort to largely develop this branch of the citrus industry, as I believe it to be entirely practicable for Florida and California to eventually control the American markets in this trade.

What I desire to indicate is, that it is not the kind of business to base a boom upon either as a speculation in real estate or with the hope of rapid fortunes from sales of fruit. Those who undertake it must so systematize and apply the requisite methods of curing—regardless of cost or apparent loss of time in reaching market—as to nearly or quite eliminate the risk of loss or shrinkage after the fruit leaves the packing house. Only in this way can the business be made staple in character, like the Sicily lemon trade, which has regularly, for a series of years, profited upon the necessities and tastes of the people of this and other countries.

The exact and proper methods of curing have, until recently, been supposed to be both difficult and peculiar; but the success of a few earnest and persistent men, coupled with their plain and simple statement of manner of handling, has quite exploded the fallacy.

Capital is a great assistance, however, and the more it is put into the business the greater the relative economy in realizing the maximum of profits. To this end I suggest that the initiative steps, looking toward the capture of the markets east of the Rockies, be left mainly to capital and corporate management, and that those would-be growers, having but limited resources, give their attention to such branches of fruit production as are inexpensive in original outlay and subsequent management. While the profits may not compare favorably with what seems to be expected from lemon growing, yet they are reasonable and certain.

The thoroughly marketable lemon is to a great extent a hand-made article, and should bear for its trademark, "No excellence without great painstaking." Following this motto, there are millions to California in the lemon trade, with no immediate danger of overdoing it. If capitalists could realize and accept this fact, and would agree to put money (at the proper time) into large packeries throughout the lemon

belt of this State, and would further agree to be satisfied with such a per cent of profit in running them as would stimulate production, then it would answer for every prospective grower to take a hand in booming the lemon industry.

Small growers—the more of them the better—would then contribute greatly to the strength and stability of such enterprise by the steady and even flow of fruit during the packing season, on the principle that “many a little makes a mickle.” The market would be at their door, and they would soon learn what fruit was salable, when to pick, and how and with what care to convey it to the packery. The returns to them for each picking would be immediate, and at the same time the aggregate proceeds of the crop would be distributed through several months, and would, perhaps, be more economically expended than if received in one lump sum. This is substantially the Italian method of gathering the aggregate crop for export, and it strikes me that it might be adopted here to the mutual benefit of both capital and labor, or, in other words, of producer and packer. The thorough application of systematic methods of curing is thus placed in the hands of a central experienced management in each locality, and the grower is relieved from further care or risk after delivery of the fresh fruit in such condition as will pass the inspector, who determines the quality and fixes the price.

What a great and profitable industry might be built up on this coast if only capital and labor would unite and work together in mutual interest and harmony, and without waste or friction.

THE PLACER COUNTY FRUIT DISTRICT.

By W. G. GESTER, of Newcastle.

It is located about on the north line of the central third of the State. It embraces a block of territory ten miles in width along the Central Pacific Railroad for a distance of thirty miles. Somewhat similar conditions, as regards natural formation, climate, and resources, exist in the neighboring counties of Sacramento, El Dorado, and Nevada.

Geologically it is made up of numerous irregular spurs and intervening valleys that extend down and out westward from the Sierra Nevada. The extreme tops of the most prominent ridges are in places capped with lava and cemented gravel, upon which exists a not particularly heavy growth of oaks and digger pine. But one attempt has been made, to my knowledge, to utilize these rather forbidding lava spaces. The experiment was with the olive; success not such as to induce extended plantings.

The slopes of these ridges, the knolls and rolling valleys between them, are the fruit lands. The lowest portions of many of the ravines have been denuded of soil by gold hunters. In some cases these mined-out places have been subsequently filled with “slickens.” Some of the best cherry and pear orchards the district has are planted in these slickens beds.

Very little of the soil suitable for horticulture is without a natural tree growth, consisting mainly of white, black, and live oak, digger pine, and chaparral. The cost of fitting such ground for orchard planting

varies from \$15 to \$30 per acre; and such uncultivated lands are valued on the Assessor's books at from \$10 to \$75 per acre.

Real property is already divided into such small holdings that the large orchard of the capitalist will necessarily be a rare exception. It is already a region of small homes.

The soil at the upper or eastern end of the district has a foundation of slate. Much the larger part, especially in that portion in the lower end of the district most thoroughly developed, is a disintegrated granite of dark red color, derived from an unusually large constituent proportion of peroxide of iron. The loose top soil varies in depth from two to five feet, except in the valley bottoms, and in occasional instances on north slopes, where it is deeper. Tree roots, however, go through the soil and grow into the bedrock, so called, which is hardly so much a rock as an indurated soil.

Growers of fruit in the slate soil declare that they have no need to resort to artificial irrigation. The slaty portion of the district is that portion having the greatest elevation and the greatest consequent annual rainfall—thirty to forty inches. It is from one thousand three hundred to three thousand feet above sea level. The average rainfall on the granite soil is twenty-five inches. Artificial irrigation is essential over all this district, which is from one hundred to one thousand three hundred feet above sea level. The water used comes from the higher altitudes in the Sierra Nevada. It is sold by the South Yuba Canal Company to consumers for \$45 per miner's inch per year. There are no permanent water rights appertaining to the lands.

With care a miner's inch of water will irrigate five acres of fruit trees. It costs a Placer County fruit grower, therefore, \$9 per acre annually for water for bearing orchards.

Water is distributed among the trees by small trenches. Flooding, from the nature of the lay of the land, is impossible. It is all sloping, some exceptionally steep slopes at an angle of 20 degrees. Some of these steep slopes in the Citrus Colony, near Loomis, have been terraced. This is very expensive work, but satisfactory, it appears, to owners, whose orange terraces are certainly very beautiful. Terracing is never absolutely necessary, and the great initial expense will limit its use. Moreover, unplanted land with light slopes is still plentiful.

The orchards of the Placer County fruit district are small. The largest at present in bearing do not exceed eighty acres. The average size is, perhaps, about twenty acres. No point in the district is more than five or six miles from a railroad station. This circumstance, in connection with the excellent carrying quality of the foothill and mountain fruit, accounts for the large proportion of fruit disposed of in its fresh state. There is not a cannery nor permanently running evaporator in the district. There are, however, ten wholesale shipping concerns. These houses buy for sale and shipment on their own account, or sell on commission, at the option of the producer.

During the season of 1890 they shipped thirteen million pounds of fresh fruits, one fifth of the total fresh deciduous fruit output of the State, or one tenth of the total fresh fruit shipments (citrus and deciduous) of the entire State for that year. During the season of 1891, up to the first day of November, they have shipped nineteen million pounds, an increase over 1890 of 47 per cent. About 75 per cent of this output consists of peaches. The rest consists principally of grapes, pears,

plums, cherries, and berries. To name all the fruits shipped would be to name the list of all the fruits grown in California, except the pineapple and banana. Many of them are, however, grown in but small quantities.

The crops of citrus fruits promise to increase rapidly. There has been much planting of orange trees during the past four years, and a very noted increase during the past two years. Citrus fruits ripen, or perhaps, more correctly speaking, they acquire sufficient color for marketing very early. Prices secured are consequently high, and orange growing has proved very remunerative. All of the orange crop of the Placer district is marketed before the first of January. Most of the early varieties—Homosassa, Parson Brown, etc.—and some of the seedlings, are ready for the pickers by the latter part of November. The comparatively frostless part of the district (Placer's portion of the Northern Citrus Belt) lies below the city of Auburn.

The more elevated portion of the district about Colfax and Dutch Flat supplies perhaps the best grapes, pears, and apples.

That the fruit industry of the Placer district is a profitable one, is evidenced by the largely increased planted areas, made up not of large orchards, but of innumerable and annually recurring additions to all the little orchards in its boundaries.

The average cost per acre for the labor of cultivating, irrigating, and harvesting on the slopes, which form so large a component part of the district, is presumably greater than on comparatively level ground. The compensating advantage the Placer County grower has is in his peculiarly fortunate location as regards earliness of fruit, and in his markets. Avoiding comparison, it may safely be asserted that his fruit ripens early, even for California, and although the bulk of his crop goes to the far East, a very respectable percentage is distributed throughout the adjoining States and Territories to what is known as the "local trade;" and it is a very remunerative one, enabling him to dispose of much fruit which, unavoidably ripening too far, is unfitted for the trans-Missouri market. In spite of the fact that little fruit is dried or preserved for market, there is little waste.

The horticultural calamities that are dreaded are confined principally to insect pests. Wet winters and consequent floodings are not feared. Killing frosts are very rare. Orange smut is unknown; so are all orange pests so far. On deciduous trees common scale and codlin moth have caused most damage, but careful and universal use of the spray pump has nearly obliterated the former, and is proving of very noticeable benefit in the case of the moth. Our County Board of Horticulture is strict in the performance of its duties and has the staunch support of the county government and the mass of the inhabitants throughout the district.

The element that detracts most largely from the pleasure of existence in the Placer fruit district is the heat of midsummer. The months of July and August are very often uncomfortably warm. The thermometer frequently registers 100 degrees Fahrenheit, and occasionally 6 or 7 degrees more. Continual moderate heat, entirely void of humidity, and continual sunshine may be expected from May to November. The early ripening of citrus crops, and especially their early coloring, are natural consequences of this phase of the climate.

Making a prediction, based upon a rather careful survey, I should say

that the Placer County fruit district will always grow a large variety to supply the demands of the market for fresh fruits; but I think the two varieties that will overshadow all the others in proportions and importance will be the peach and the orange.

RESOLUTIONS.

MR. BENSON offered the following:

Resolved, That a vote of thanks be tendered to the people of Wheatland for their generous hospitality and courteous entertainment.

Adopted.

MR. AIKEN offered the following:

Resolved, That we tender the presiding officer and the officers of this Convention our hearty thanks for the able and impartial manner in which they have performed their duties on this occasion.

Adopted.

ADJOURNMENT.

MR. BUCK: It is now time for adjournment, and I wish to thank you all for the strict and kind attention to the gavel while it has been used by me. I certainly have spent four very pleasant days—days that I feel I have been highly honored by the audience over which I have been called upon to preside.

Adjourned *sine die*.

B. M. LELONG,
Secretary.

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